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American Journal of Diseases of Children

VOLUME 39 FEBRUARY, 1930 NUMBER 2

MOTILITY OF THE EMPTY STOMACH IN NORMAL AND IN MALNOURISHED ASTHENIC CHILDREN*

ALICE RUPP, M.D., PH.D.
AND
FREDERIC W. SCHLUTZ, M.D.
MINNEAPOLIS

Most investigators who have studied gastric motility in children have made use of the methods of gastric expression and roentgen examination chiefly for the determination of the emptying time of the digesting stomach. Such studies are limited by the fact that the examinations are brief and are made only at certain intervals, so that it is impossible to obtain a continuous record of gastric activity.

As the activity of the stomach is somewhat variable, it was thought that a continuous examination over an extended period of time might yield valuable information with regard to the inherent power of the gastric musculature under certain conditions. The present problem is concerned with the motility of the empty stomach in normal children, and in those who are of the asthenic body habitus and in a malnourished condition, being underweight for the age and height. This preliminary report includes a study of five normal and fourteen asthenic children.

The method employed was that developed by Carlson,[1] in which graphic registration of the movements of the stomach was obtained in the following manner: A deflated balloon attached to one end of a rubber tube was swallowed by the subject, the other end of the tube being connected with a manometer fitted with a lever, arranged in such a manner that a graphic record was obtained on a smoked paper mounted on a moving drum. When the balloon was inflated at the beginning of an experiment, the pressure changes due to contractions of the stomach were recorded. The advantage of the method lies in the fact that a continuous record of the activity over a long period of time may be obtained.

Carlson[1] discovered that the empty adult stomach underwent alternating periods of activity and relative quiescence, the activity consisting

* Submitted for publication, Oct. 3, 1929.

* From the Department of Pediatrics and the Institute of Child Welfare, University of Minnesota.

1. Carlson, A. J.: The Control of Hunger in Health and Disease, Chicago, University of Chicago Press, 1916.

in powerful rhythmic contractions which increased in amplitude and frequency as activity progressed, and which had an individual duration of thirty seconds. He therefore designated this as the "thirty-seconds rhythm," the entire period as the "hunger period" and the individual contractions as "hunger contractions." In addition, there appeared a rhythm with waves of twenty seconds' duration, which he considered a tonus rhythm due to tonus contractions of the fundus, and called the "twenty-seconds rhythm." These he found to be always present in the healthy adult stomach, so that the period of inactivity between hunger periods was one of relative quiescence only. Carlson's tracings showed also a pulse pressure rhythm and a respiratory pressure rhythm. From his results with dogs, he divided the contractions of the hunger period (thirty seconds rhythm) into three types according to the degree of tonus of the stomach. The type 1 contractions occurred with feeble tonus, were relatively weak at the beginning of a period, but increased in amplitude and frequency during activity. Type 2 were strong contractions of thirty seconds' duration with the stomach in strong tonus. These were frequently interrupted by short periods of incomplete tetanus, resembling those occurring in men at the culmination of a contraction period. Type 3 consisted of incomplete tetanus, a persistent strong tonus with a series of superimposed rapid contractions. The stronger hunger contractions (types 2 and 3) were similar to those observed in men, but they occurred more frequently in the young vigorous dogs. Iwanow [2] performed twenty-eight experiments on twenty-four adults, and found essentially the same types of contractions as described by Carlson, although his classification differed somewhat from that of Carlson.

The true nature of the hunger contractions has been explained in recent years by obtaining simultaneously graphic record and roentgenograms. The subject was placed on the x-ray table at the time hunger contractions were being recorded by Carlson's method, so that a series of films could be obtained as desired.

Rogers and Hardt [3] using a bismuth coated balloon, described the hunger contraction as a strong peristaltic contraction sweeping from the cardia to the pylorus, occurring in a hypertonic stomach, the tonus running into tetanus or maintaining a level on which the separate peristalses were superimposed. Rogers and Martin [4] using a simple air filled balloon, observed in one subject that the type 1 contraction consisted of a circular contraction of the lower half of the stomach. Later Rogers and Martin [5] made a more extensive study of five healthy men.

2. Iwanow, W.: Ztschr. f. d. ges. exper. Med. **54**:326, 1927.
3. Rogers, F. T., and Hardt, L. L. J.: Am. J. Physiol. **38**:274, 1915.
4. Rogers, F. T., and Martin, C. L.: Am. J. Physiol. **76**:349, 1926.
5. Rogers, F. T., and Martin, C. L.: Am. J. Physiol. **82**:113, 1927.

The type 1 contraction began with a constriction of varying intensity and width in the lower third of the stomach which forced the air backward into the fundus, thereby distending it. This distention initiated a peristaltic wave in the upper half of the stomach which swept downward over the pylorus. In the meantime, a maintained tonic or circular contraction of the lower half or third of the stomach was noted. At times the latter was present without the peristaltic waves. Type 2 contractions were similar to type 1, but of greater frequency and amplitude. Type 3 contractions (incomplete tetany) consisted of a series of deep peristaltic waves cutting completely across the lumen, arising high in the fundus and occurring at such a rate that a new contraction wave began before the relaxation of the preceding wave was complete. There also appeared a spasm of the lower third with or without peristaltic waves in the fundus. At the height of a hunger contraction, there was complete obliteration of the lumen of the lower portion of the stomach. At times, repeated peristaltic waves occurring at irregular intervals without complete relaxation caused an increased intragastric pressure for a short period, thus simulating a "tonus rhythm." While the twenty-seconds rhythm was being recorded graphically, the only observed motility was a series of shallow peristaltic waves running over the lower two thirds of the stomach. Martin and Rogers [6] again stressed the fact that the contraction of the antrum was invariably present during a hunger contraction, and that this was probably the cause of the associated hunger pains.

Templeton,[7] using on man a modification of the "open nipple" method previously described by him,[8] interpreted the hunger contraction as a peristaltic wave initiated by a slow rise in tone and followed by a definite contraction in the cardia, which then passed as a wave to the pylorus where the contraction was sharp and sudden without an initial rise in tone. Such a wave occurred in a vigorous hunger period. In a weaker hunger period the waves originated nearer the pylorus.

A correlation of the facts regarding the nature of the hunger contractions as presented here affords a ready interpretation of the tracing, and an analysis of the condition of the gastric musculature during the hunger period.

GASTRIC MOTILITY IN THE NORMAL CHILD

Carlson and Ginsberg [9] studied the tonus and hunger contractions of new-born infants before food had entered the stomach, and found that these were the same as in the adult, except that the periods of

6. Martin, C. L., and Rogers, F. T.: Am. J. Roentgenol. **17**:222, 1927.
7. Templeton, R. D., and Johnson, U.: Am. J. Physiol. **88**:173, 1929.
8. Templeton, R. D.: Am. J. Physiol. **85**:512, 1928.
9. Carlson, A. J., and Ginsberg, H.: Am. J. Physiol. **38**:29, 1915.

quiescence between hunger periods were shorter, averaging from ten to fifteen minutes. The hunger periods ended in incomplete tetanus, an evidence of youth and a vigorous stomach, according to the investigators. The stomachs of prematurely born pups, also tested before food was given, showed a continuous motor activity, the waves lasting from thirty to sixty seconds or longer, and at times seeming to be periods of gastric tetanus. Carlson [1] reported forty-five observations on thirty normal breast-fed infants from 24 hours to 4 weeks old. Feeble tonus contractions of the fundus appeared one hour after nursing, and gradually increased in frequency and intensity until vigorous hunger contractions were present in two and one half or three hours.

Patterson [10] worked on a series of healthy dogs, ranging from pups of 5 to 6 weeks and 5 to 6 months of age to young adult, adult and old adult. He found that the hunger contractions decreased with age, as a result, to some extent, of a decrease in tonus and rapidity of contractions, but the most marked effect was in the duration of the active periods. In pups 5 to 6 weeks of age, the quiescent periods were only of from two and five tenths to three and four tenths minutes' duration. These periods gradually became longer with advancing age until in the old adult they lasted from one and one sixth to three and two thirds hours. The active periods in the young pups were from four and one half to five and two thirds hours' duration, in the old adult from one half to two hours. Patterson [11] considered the rate of metabolism of importance, the slower rate being controlled chiefly by the age factor. That the rate of general body metabolism is not the main factor was shown by the fact that in prolonged starvation, which results in increased metabolism, the hunger contractions of the old dogs were not so vigorous as those of young dogs. Therefore the age of the stomach itself would seem to be of more importance. From the work on dogs of various ages, and on the infant and adult human beings, there appears to be a decrease in activity of the empty stomach proportional to the advance in age.

The present report includes a series of ten experiments on five normal children ranging in age from 4 to 14 years. The method described by Carlson [1] was used, the balloon varying in size according to the size of the child. The balloon was attached to one end of a rubber catheter (number 18-22 French), the other end of which was connected by means of hard rubber tubing to a chloroform manometer. The child was given the tube in the morning before breakfast, so that the record was obtained on a stomach that had fasted from fourteen to sixteen hours. The experiments lasted from one to two and one-half hours, at least three being performed on each child. Those in which

10. Patterson, T. L.: Am. J. Physiol. **33**:423, 1914.
11. Patterson, T. L.: Am. J. Physiol. **37**:316, 1915.

vomiting and gagging occurred were discarded. Experiments were repeated on each child until at least two similar tracings, which were felt to be representative for the subject, were obtained. Little difficulty in tubing was encountered after the child once learned that the procedure was harmless. The children rested comfortably on a bed during the course of an experiment and often fell asleep. Care was taken that the preceding night had been a peaceful one, and that the temperature of the child was normal.

When the tracings were taken, the pressure was adjusted so that each tracing showed, in addition to the gastric contractions described by Carlson,[1] the respiratory and pulse pressures. The time was recorded in minutes.

When the tracings obtained on normal children are reviewed, certain general facts are prominent. The various types and combinations of waves previously described by Carlson [1] and Iwanow [2] were shown on our tracings. During the hunger period activity usually progressed through type 1 to type 2 contractions for varying lengths of time. Periods of incomplete tetanus of one or two minutes' duration occurred frequently. Longer periods of marked tetanus lasting from four to twelve minutes culminated in active periods in 60 per cent of the experiments with normal children. The twenty-seconds rhythm occurred only during periods of low tonus, before hunger activity began. The marked inhibition of hunger contractions due to the entrance of the balloon into the stomach stressed so emphatically by Carlson was by no means a consistent observation in our experiments on children. Many times immediately after the balloon was put into the stomach and inflated, the tracings showed type 1 contractions, and often type 2. Also we obtained periods on some tracings characterized by absence of noticeable stomach movements, only the respiratory and pulse waves being shown. Such records persisted in spite of readjustment of pressure in the balloon, and they did not appear to be due to the fact that the pressure in the balloon was too low to record the gastric movements. After these periods of absolute quiescence had been present for a variable time (from four to twenty-three minutes), they were replaced by others in which tonus waves, or the twenty-seconds rhythm, or both, appeared, the change occurring without any manipulation of the apparatus. It therefore appears likely that periods without movement take place in the stomach of the normal child.

In order to compare the gastric activity of the child with that of the infant and also with that of the adult, our figures are given with those of other investigators in table 1.

From table 1 it appears that the activity of the child's stomach is intermediate between that of the new-born infant and that of the adult. This is consistent with Patterson's [11] theory that gastric activity varies according to the age of the subject.

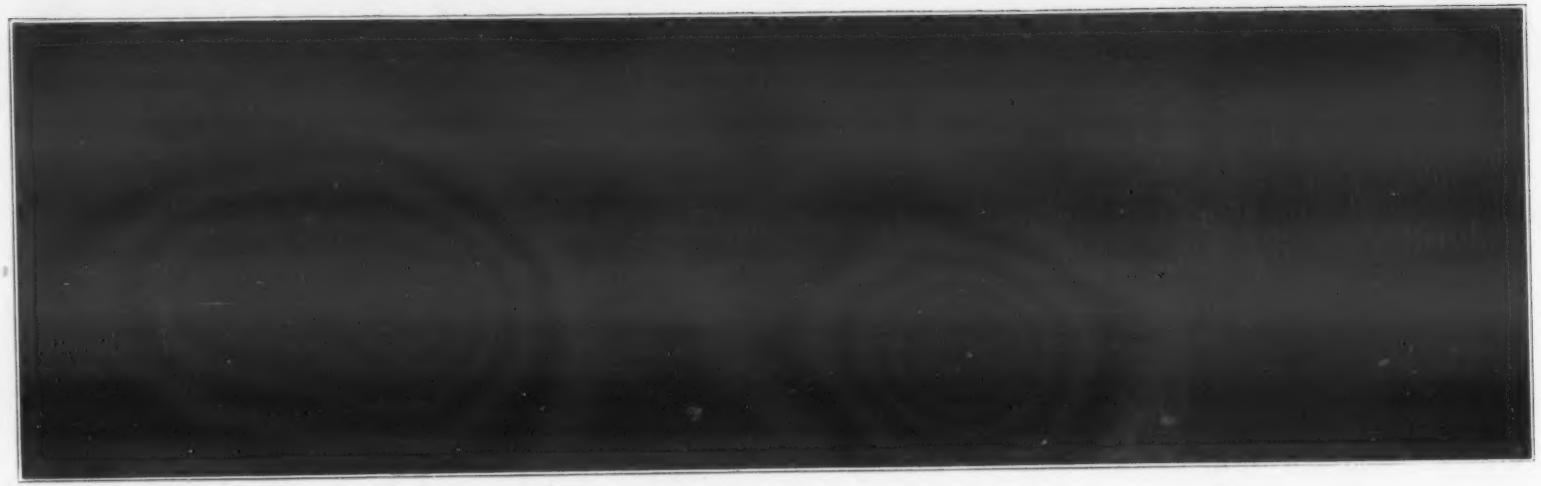

Figure 1.—(Left)

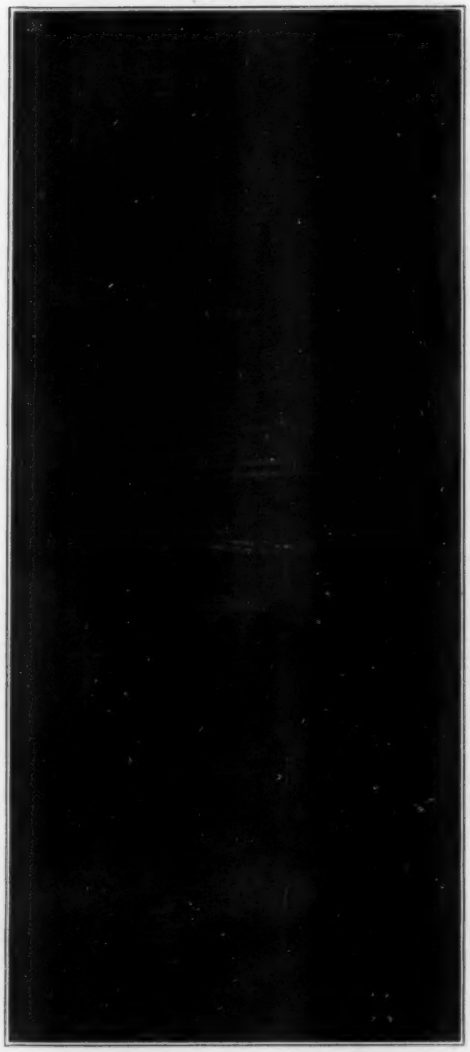

Figure 1.—(Right)

Fig. 1.—Tracing of gastric activity in E. B., a normal child, showing the end of a period of quiescence and the beginning of an active period.

Figure 2.—(Left)

Figure 2.—(Right)

Fig. 2.—Tracing in A. S., a normal child, showing marked activity when balloon was inserted. Note absence of inhibition due to inflation of balloon at *X*.

Figure 3*A*.—(Left)

Figure 3*A*.—(Right)

Fig. 3*A*.—Tracing of A. S., a normal child, showing period of maximum activity. Note the period of tetanus followed by abrupt cessation of contractions, typical of gastric activity in the normal child.

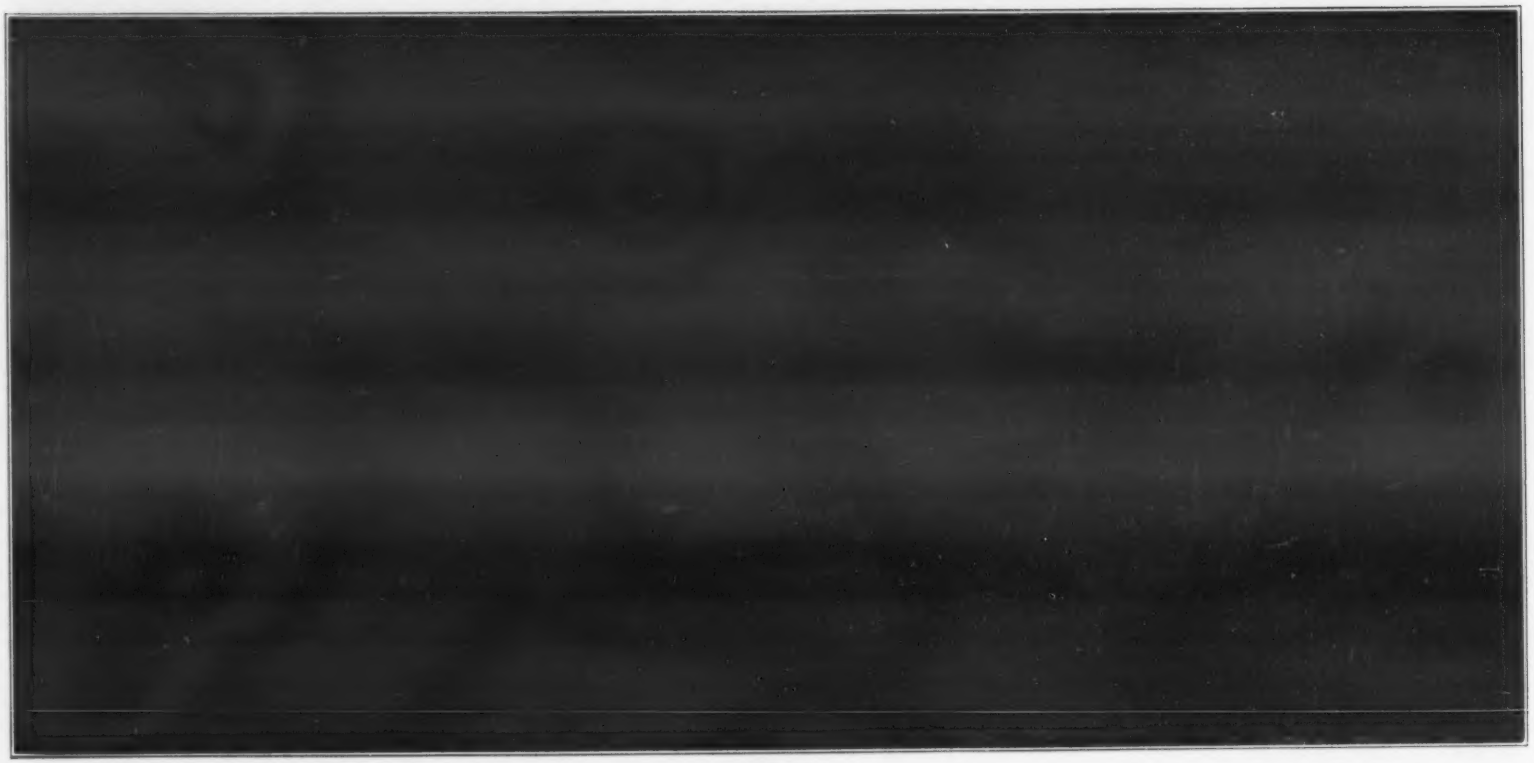

Figure 3*B*

Fig. 3*B*.—Tracing of H. H., an asthenic child, showing period of maximum activity, typical of the asthenic child. Note the absence of tetanus before the cessation of contractions, in contrast with figure 3*A*.

GASTRIC MOTILITY IN MALNOURISHED ASTHENIC CHILDREN

Mills [12] has defined the characteristics of the four types of bodily habitus, those of the asthenic type being a frail, slender physique, with a longe narrow thorax and a short abdomen, light body weight and delicate bony structure, a narrow intercostal angle, pendent heart and low gastro-intestinal tract. In this type the stomach is atonic, in keeping with a poor degree of tonus of the entire alimentary tract, and the motility is the slowest of any type. The classification of bodily types as worked out by Mills holds true also for children, according to Sauer.[13] By means of roentgenograms taken after a barium meal, Mills [14] tested the emptying time of the stomach in the four types of adults. He found that the emptying time of the asthenic patient was eighty-one

TABLE 1.—*Activity of the Stomach in the New-Born, the Child and Adult*

	Quiescent Period	Active Period	Tetanus
Adult. (Carlson, 1916)			
Feeble contractions	1-3 hours	6-20 minutes 10-25 (Av. 14) contractions	2-5 minutes
Stronger contractions	½-2½ hours	½-1½ hours (Av. 30-45 minutes) 20-70 contractions	10-15 (Av. 2-3) minutes
Adult. (Iwanow: Ztschr. f. d. ges. exper. Med. **54**: 326, 1927)	½-2 hours	¼-1½ hours (Av. 20-25 minutes)	
Child	13-27 minutes	11-117 (Av. 50) minutes 17-217 (Av. 93) contractions	4-12 minutes
New-born. (Carlson, 1916)	10-60 minutes	Began 1 hour after feeding; strong contractions in 2½-3 hours	

minutes slower than the hypersthenic, and fifty-seven minutes slower than the asthenic type. Nick,[15] also testing motility by the emptying time, observed the greatest ease of relaxation of tonus in asthenic women. Hardt and Joseph [16] tested a number of adults by Carlson's method, and noticed that the kymograms showing decreased intragastric tension were those of patients with marked general debility and asthenia. Sauer, Minsk and Alexander [13] studied a group of twelve normal children with good appetites in comparison with twenty-one undernourished children with poor appetites. They made use of a motor meal containing barium sulphate, and took serial films until the stomach was empty. Their results showed that in children with good

12. Mills, R. W.: Am. J. Roentgenol. **4**:155, 1917.

13. Sauer, L. W.; Minsk, L. D., and Alexander, W. G.: Gastric Findings in Children with Anorexia, J. A. M. A. **79**:184 (July 15) 1922.

14. Mills, R. W.: Am. J. Roentgenol. **9**:731, 1922.

15. Nick, G. H.: Ztschr. f. klin. Med. **69**:495, 1923.

16. Hardt, L. L. J., and Joseph, E. G.: M. Clin. N. Amer. **7**:63, 1923.

appetites the emptying time averaged four and one-half hours, all stomachs being empty in five hours; whereas in the underweight children the average emptying time was six and one-tenth hours. The majority of children in the underweight group belonged to Mills' hyposthenic or asthenic types. From the work of all of these investigators it appears that the gastric motility in asthenic patients is slower than in normal ones, and that the same holds true for undernourished as compared with normal children.

The experiments on our asthenic children were conducted in the manner described here for normal children. The series includes

TABLE 2.—*Gastric Activity in Normal and Malnourished Asthenic Children*

	Number of Subjects	Number of Experiments	Low Activity (Absence of Hunger Contractions) Average Duration of Periods in Minutes	Medium Activity (Type 1 Contractions) Average Duration of Period with Average Number of Contractions	High Activity (Type 2 Contractions) Average Duration of Period with Average Number of Contractions	Tetanus Total Number and Duration of Periods and Total Number of Contractions
Normal	5	10	14.9	59.9 contractions in 41.3 minutes	44.9 contractions in 25.4 minutes	6 periods with 126 contractions in 46 min.
Asthenic without gastro-intestinal complaints	11	27	33.9	33.5 contractions in 25.5 minutes	17.3 contractions in 10.3 minutes	No periods
Asthenic with gastro-intestinal complaints	3	10	55.2	29.9 contractions in 19.3 minutes	2.9 contractions in 1.9 minutes	1 period with 14 contractions in 4½ minutes

fourteen children, ranging in age from 4 to 14 years, and being from 4 to 45 pounds (2 to 20 Kg.) underweight.

In order to compare the activity in the normal and the asthenic children, the activity was divided into four stages: (1) low activity in which no hunger contractions, as defined by Carlson, were present; (2) medium activity, in which type 1 contractions were present exclusively or predominantly; (3) high activity, in which type 2 contractions were present exclusively or predominantly including short periods (from one to two minutes) of high tonus with incomplete contractions; and (4) true tetanus complete or incomplete, lasting four minutes or longer. The asthenic children were divided into two groups, one including those without gastro-intestinal complaints and one including those with gastro-intestinal complaints, such as marked persistent anorexia, nausea, vomiting and abdominal distress. The results are shown in table 2.

From table 2 it can be seen that the stomachs of the normal children exhibit the greatest activity judged in the following ways: (1) the periods of low activity are shorter in the normal than in the

asthenic children; (2) the periods of activity are longer in the normal persons; (3) a larger number of contractions is present in the longer periods, and (4) the periods of tetanus are more frequent and of longer duration in the normal children. By the same method of comparison the activity in the asthenic patients without gastro-intestinal

TABLE 3.—*Gastric Activity in Normal and Asthenic Children, Figured on a Percentage Basis*

	Number of Subjects	Number of Experiments	Low Activity (Absence of Hunger Contractions) per Cent Duration of Period	Medium Activity (Type 1 Contractions) per Cent Duration of Period	High Activity (Type 2 Contractions) per Cent Duration of Period	Tetanus Occurrence in Total Number of Experiments
Normal children	5	10	100	100	100	Present in 60% experiments
Asthenic without gastro-intestinal complaints	11	27	227	62	40	Present in 27% experiments
Asthenic with gastro-intestinal complaints	3	10	370	47	7	

TABLE 4.—*The Range in the Number of Contractions Occurring During Single Hunger Periods in Normal and Asthenic Children*

	Number of Hunger Periods	Minimum Number of Contractions in a Single Period	Maximum Number of Contractions in a Single Period	Average Number of Contractions
Normal children	12	17	217	93
Asthenic without gastro-intestinal complaints	27	8	106	46
Asthenic with gastro-intestinal complaints	6	3	35	19

TABLE 5.—*The Duration in Minutes of Single Hunger Periods in Normal and Asthenic Children*

	Number of Hunger Periods	Minimum Duration of a Single Period in Minutes	Maximum Duration of a Single Period in Minutes	Average Duration in Minutes
Normal children	12	11	117	51.5
Asthenic without gastro-intestinal complaints	27	4	80	32.7
Asthenic with gastro-intestinal complaints	6	3	28	16

complaints is greater than in those with such complaints. The same gradation is evident in table 3 in which the activity is figured on a percentage basis, the normal being taken as 100.

In table 4 is a comparison of the number of contractions, and in table 5 the duration in minutes of individual periods of hunger activity in each of the three groups is given.

When one attempts to determine the cause of the hypomotility in the malnourished asthenic children, many factors must be taken into consideration. It is possible that the low lying position of the stomach is concerned. There is also the inter-relation between hypomotility, anorexia and malnutrition, and the relation between diet and hypomotility, to be taken into account. The rate of metabolism, the chemical composition of the blood and the gastric secretion are possible associated factors. The question still remains whether the hypomotility is simply one phase of a generally lowered vitality in a malnourished child, irrespective of bodily habitus, or whether the malnutrition alone is responsible for the hypomotility. Experiments are in progress to determine as many of these factors as possible.

SUMMARY

Gastric activity during hunger in children is intermediate in degree between that in the new-born infant and that in the adult.

The activity of the empty stomach is decreased in malnourished asthenic children in comparison with the normal, and is still further decreased in those with certain gastro-intestinal complaints.

No explanation for this decrease in activity is offered as yet.

THE INCIDENCE OF SINUSITIS IN ASTHMATIC CHILDREN *

ROBERT CHOBOT, M.D.
NEW YORK

The importance of sinus infection in asthma has been thoroughly discussed in the case of adults. However, it is comparatively recently that the rôle of sinus infection in children has been at all observed, and comparatively little work has been done on these lines with asthmatic children. Ruskin [1] discussed the problem of sinusitis in children and concluded that the condition is much commoner than the textbooks would have one believe. He thought that every case of acute rhinitis involves the accessory nasal sinuses to some degree.

According to Hark,[2] who published a report on 394 autopsies on children in whom he had opened the accessory nasal sinuses, he found evidence of disease in 62 cases. Sinus infections, according to Gottlieb,[3] may produce pulmonary symptoms in four ways: (1) by direct extension, purulent droppings from the pharynx directly infecting the tracheal and bronchial mucous membranes; (2) by blood stream or lymphatic absorption; (3) by mechanical nasal obstruction causing mouth breathing, thereby rendering the bronchial mucous membrane more permeable to infections; (4) by producing a nerve reflex, by hyperirritation or disease of the nasal ganglion according to the mechanism discussed by Sluder.

In a paper on the relation of paranasal sinus infection to disease of the lower respiratory tract, Mullin [4] traced injected suspensions of india ink from the maxillary sinuses of rabbits to the submaxillary nodes, internal jugular nodes, the lymph ducts, the great veins and the right side of the heart and the lungs. In none of them were the faucial tonsils affected. He expressed the belief that certain types of disease of the paranasal sinuses tend to produce peribronchial infection with resultant chronic bronchitis, bronchitis and asthma.

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* Submitted for publication, Oct. 5, 1929.

* From the Asthma Clinic of the Department of Pediatrics, Post-Graduate Hospital and Medical School.

1. Ruskin, S. L.: Sinusitis in Children, Am. J. Dis. Child. **36**:1020 (Nov.) 1928.

2. Hark, quoted by Ruskin (footnote 1).

3. Gottlieb, M. J.: Intranasal Disease and Asthma, J. A. M. A. **85**:105 (July 11) 1925.

4. Mullin, W. V.: Relation of Paranasal Sinus Infection to Disease of the Lower Respiratory Tract, J. A. M. A. **87**:739 (Sept. 4) 1926.

It has been my observation that in asthmatic children the incidence of sinus infection was comparatively frequent, and because no figures were available 100 cases of asthma were taken in sequence and studied.

The ages of the children studied ran up to 15 years. Sixty cases (60 per cent) were in male patients.

All the patients were tested by the intracutaneous method and with extracts made according to the method of Coca. Only 15 per cent of

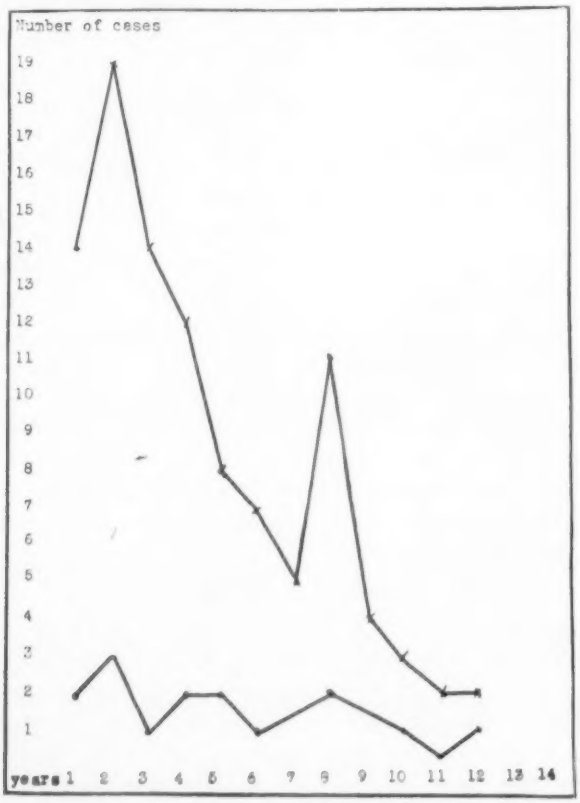

Fig. 1.—The upper graph shows the age of onset of the first attack of asthma in the entire series studied. The lower graph shows the age of onset in the nonsensitive group of cases studied.

the patients reacted negatively to the skin test, and only those reactions were considered positive that showed a weal with pseudopod formation. Each positive reaction was confirmed by retesting. Figure 1 is presented to show the ages at onset of the first attack of asthma. Fourteen per cent of the patients had their first attack in the first year of life and 19 per cent had their first attack in their second year. This

compares quite closely with Bullen's [5] recent study of 235 cases in which the peak of incidence was reached in patients in their third year, the percentage being 15.3. There was a steady decline in the number of cases in children over 3 years of age, as indicated in figure 1. The lower graph in figure 1 is an analysis of the fifteen cases in which all skin tests were negative. Although this series of cases is small, it is of interest to note that the graph parallels the one above it.

Figure 2 shows the result of analyzing the fifty-nine cases of sensitive patients in regard to the age of onset of the first attack. Fifteen

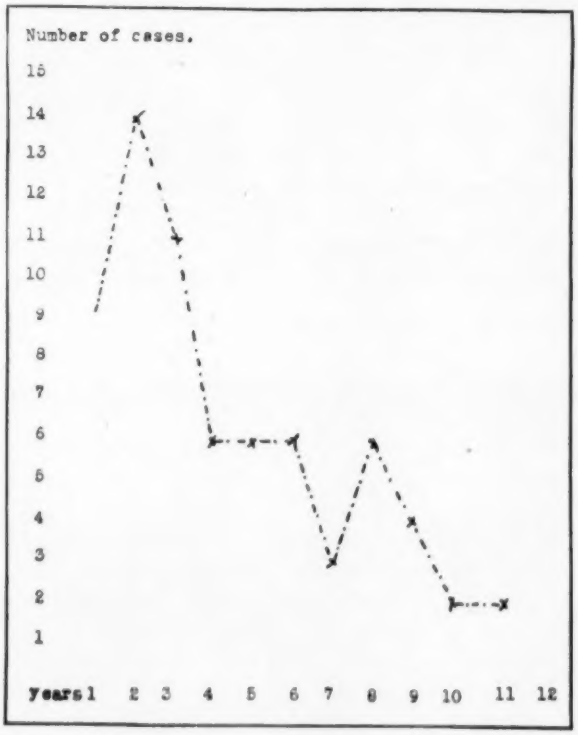

Fig. 2.—The age of onset of the first attack of asthma in the hypersensitive group of cases without any complicating nasal infections.

per cent of these patients had their first attack in the first year of life and 23 per cent had their first attack in their second year.

Spain and Cooke [6] studied a group of 462 patients with hay-fever and asthma who gave positive reactions to the skin tests, and they found 58.4 per cent with a positive family history as compared with only 7

5. Bullen, S. S.: Some Observations on the Natural History of Asthma in Childhood, New York State J. Med. **29**:545 (May 1) 1929.

6. Spain, W. C., and Cooke, R. A.: J. Immunol. **14**:521 (Sept.) 1927.

per cent in a control group of normal persons. These figures have been confirmed by many observers. However, in the case of patients with infective asthma, that is, those with negative skin reactions and with positive sinus observations, no figures are available. The fifteen negative cases of this series were studied, and a positive family history found in five cases. This 33.3 per cent is in contrast to 58.4 per cent, and if a larger series of cases had been studied, the probabilities are that the hereditary factor would have been smaller.

The series of 100 cases was next analyzed in regard to the presence of any concomitant focus of infection. The criteria were positive roentgenograms checked by clinical observations. Forty-one per cent of the cases showed sinus involvement. This is less than in a series of twenty cases reported by Lierle,[7] in which all cases showed some sinus to be involved, and considerably more than reported by Bullen, who found involvement in only 13 of 235. But the latter stated that he believed some cases were undiagnosed and that a more careful search would have revealed evidence of such infections in a larger number.

Clinicians agree that even in the cases in which definite hypersensitivity has been demonstrated, the foci of infection must be treated in order to achieve the best therapeutic results. In children, however, the question of treatment is rendered more difficult because of anatomic difficulties due to teeth buds and the smallness of the sinuses. Most clinicians advocate tonsillectomy and removal of adenoids, and in many instances this procedure enables the sinuses to drain. However, it is of interest to note that many of my patients had this done without benefit before presenting themselves at the asthma clinic, and it is with such a type that the present discussion is concerned.

As an example, three cases are reported with their roentgen and clinical observations. In order to show the efficacy of combined treatment, roentgen observations at the time of admission as well as after treatment of the nose and throat had been instituted are included.

REPORT OF CASES

CASE 1.—H. P., aged 6 years, had had bronchial asthma for one year. The asthma developed following colds with no clinical evidence of food hypersensitivity. Skin tests showed moderate reactions to house-dust and insecticide, and a roentgenogram taken in November, 1928, showed a rather marked clouding of the maxillary antrum on the right side, suggesting pronounced infiltration. Treatment was started, consisting of injections of house-dust and alpine light therapy. Treatment of the nose and throat consisted of local applications and simple nasal irrigations. A reexamination of the accessory nasal sinuses in September, 1929, showed a marked improvement of the right antrum. Clinically, the child had been well for ten months at the time this article was written.

7. Lierle, D. M.: Paranasal Sinus Disease and Asthma in Young Children, Ann. Otol. Rhin. & Laryng. **35**:544, 1926.

CASE 2.—At the age of 4 years, R. I. developed asthma, nonseasonal in character. There was no history of food sensitivity. The family history was negative for asthma. Skin tests were negative and roentgenograms of the sinuses showed a slight veiling in the left antrum and ethmoidal region. The diagnosis was left antritis and ethmoiditis. The child was given injections of vaccine. Nose and throat therapy in this case consisted of tonsillectomy and puncture and irrigations of the left antrum. After a period, he was free from symptoms for several months, namely, from April to September. A further reexamination showed a moderate membranous thickening, this time a shade more noticeable

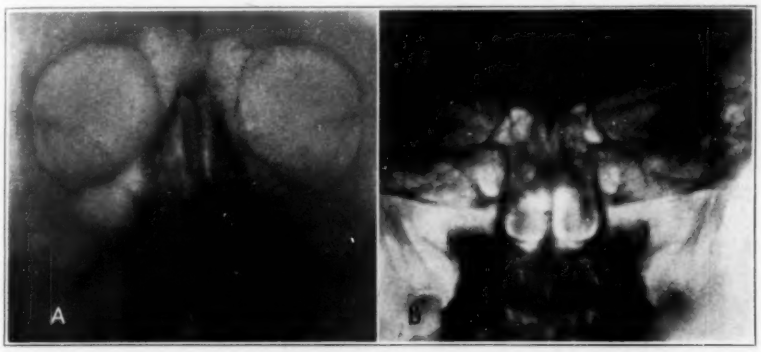

Fig. 3 (case 1).—*A*, right antrum before treatment; *B*, after treatment.

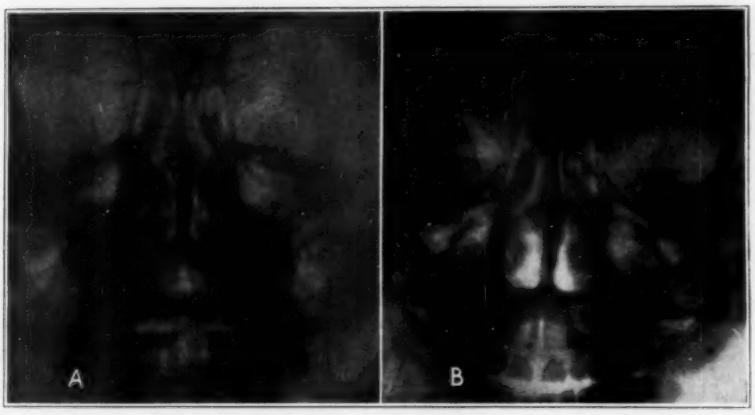

Fig. 4 (case 2).—*A*, left antrum before treatment; *B*, after treatment.

on the right antrum, suggesting moderate rather diffuse membranous thickening. Clinically, the child is now free from symptoms.

CASE 3.—G. K., aged 4 years, was admitted to the hospital in October, 1928. Asthma developed after a severe infection of the upper respiratory tract when the patient was 2 years old. The asthmatic attacks were worse in cold weather. Otherwise the history was negative, except for a previous mastoidectomy at the age of 2½ years. Skin tests showed that the patient reacted markedly to house-dust, moderately to feathers, rice, barley and oats. Treatment was started with increasing injections of house-dust with only a moderate clinical improvement.

A roentgenogram of the sinuses taken in January, 1929, showed a clouding of the maxillary antrum of the right side suggesting considerable membranous infiltration. The diagnosis was right antritis and was confirmed by reexamination of the nose and throat. The patient was given alpine light therapy together with injections of house-dust. At the same time, nose and throat therapy was instituted, which consisted of a double antrotomy and frequent packs of mild silver protein, followed by a clinical improvement in his condition. Roentgen examination of the sinuses in September, 1929, showed a moderate clouding of the maxillary antrums, a shade more noticeable on the left side, suggesting, perhaps, slight membranous thickening. A similar process, though quite indefinite, may also exist in the ethmoidal area. The patient had been free from symptoms for a period of eight months at the time this article was written.

In discussing treatment, Kelly [8] advised operative intervention when removal of the tonsils and adenoids does not suffice. He believed, however, that this is not advisable under the age of 8 years.

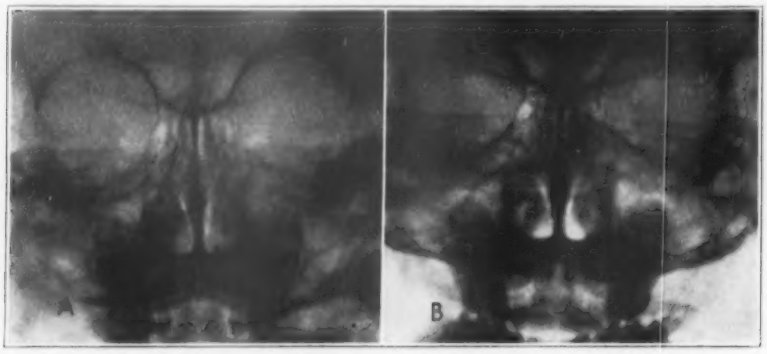

Fig. 5 (case 3).—*A*, right antrum before treatment; *B*, after treatment.

Dean [9] likewise urged conservative measures at first, which if they were unavailable should be replaced by puncture and irrigation.

Of course, treatment is preventive to some degree. Care in avoiding colds in asthmatic children is important.

The anatomy of the nasal passages, while making puncture difficult, at the same time enables many of the children to drain the sinuses spontaneously. It is for this reason that conservative measures such as shrinking down the mucous membrane and using simple nasal irrigations often suffice. Dean pointed out, however, that infants and young children should be wrapped in a sheet and placed on a bed or table, on the abdomen, with the head extending over the edge, face downward and below the level of table or bed when the irrigation is being done. In young children, the nose should never be douched with the

8. Kelly, A. B.: Chronic Nasal Discharge and Sinusitis in Children, Lancet **2**:1132, 1925.

9. Dean, L. W.: Paranasal Sinus Disease in Children, Univ. Iowa Stud. Med. **2**:5 (April 15) 1921.

head upright, because of the danger of ear complications. Older children may bend forward, holding the head low down. When care is used, this is a procedure that rarely has any untoward complications. When it is of no avail and the child's asthmatic attacks are not improved by the usual treatment, more radical steps are justifiable as indicated by the marked improvement that results in their condition.

SUMMARY

1. Incidence of sinus infection in asthmatic as well as in normal children is much higher than has hitherto been believed.

2. In the series of 100 asthmatic children, 60 per cent were boys and 40 per cent were girls.

3. Fourteen per cent had their first attack in the first year of life and 19 per cent in the second year, which figures compare closely with those of other observers.

4. Fifteen per cent of the patients studied had negative skin reactions. The incidence of the age of onset in this group parallels that in the hypersensitive patients.

5. Fifteen per cent of the sensitive patients had their first attack in the first year and 23 per cent in the second year.

6. The fifteen negative cases in this series were studied and a positive family history was obtained in five children.

7. Forty-one per cent of all patients, both sensitive and nonsensitive, had sinus infections, as shown by roentgen examination.

8. Treatment should be conservative, but puncture and irrigation should be carried out when conservative measures fail.

9. In order to achieve the best results, close cooperation with nose and throat specialists is essential.

The table gives the records of 100 cases from the asthma clinic.

History Records of the Asthma Clinic, Department of Pediatrics, Post-Graduate Hospital

Number	Sex	Age of Onset	Skin Reaction	Roentgenogram of Sinus
31728	M	8	Positive	Negative
31887	M	15 months	Positive	Negative
32200	F	2½	Positive	Pansinusitis
32207	M	8	Positive	Negative
32416	M	8	Positive	Negative
32490	F	6	Positive	Left ethmoid, double sinusitis
32552	M	1½	Negative	Pansinusitis
32600	F	2	Positive	Negative
32663	M	1	Positive	Negative
32664	F	9	Positive	Negative
32738	M	1	Positive	Negative
32739	M	1	Positive	Negative
32740	M	11	Positive	Pansinusitis
32757	M	3	Positive	Negative
32840	F	6	Positive	Negative
32870	M	12	Negative	Left ethmoid and sinus
32929	M	9	Positive	Negative
32989	F	5	Negative	Left antrum and ethmoid

History Records of the Asthma Clinic, Department of Pediatrics, Post-Graduate Hospital—Continued

Number	Sex	Age of Onset	Skin Reaction	Roentgenogram of Sinus
33208	F	10	Positive	Right antrum
33246	F	4	Positive	Negative
33248	M	3	Positive	Negative
33614	F	2	Positive	Negative
33706	F	7	Negative	Negative
33893	M	6	Positive	Right antrum
33910	F	8	Positive	Negative
33914	M	7	Positive	Left antrum and ethmoid
34021	M	4	Positive	Right antrum, left ethmoid
34352	F	8	Positive	Negative
34353	M	8	Positive	Double antrum
34463	M	1	Negative	Left antrum
34538	M	8	Negative	Right antrum
34929	F	8	Negative	Right antrum
35177	M	5 months	Positive	Negative
35475	M	3	Positive	Negative
35188	M	6 months	Positive	Negative
35899	M	4	Negative	Double ethmoid
34574	F	6½	Positive	Left antrum
34640	F	6	Positive	Negative
34936	F	2½	Positive	Negative
35400	M	2	Positive	Negative
35722	M	3½	Positive	Negative
35723	F	2	Positive	Pansinusitis
35862	M	5½	Positive	Right antrum
36242	M	2	Positive	Negative
36495	M	9 months	Positive	Antritis
31895	F	7 months	Positive	Negative
32197	F	2	Positive	Negative
32309	M	2	Positive	Right antrum
34776	F	1	Positive	Negative
34483	F	3	Positive	Negative
16210	F	2½	Positive	Negative
9857?	M	5	Positive	Negative
36366	F	7	Positive	Negative
32130	F	3½	Positive	Positive, left ethmoid
32577	M	2	Negative	Positive, left ethmoid and antrum
31142	M	11	Positive	Negative
31445	F	2	Positive	Positive, left ethmoid and antrum
30238	F	5	Positive	Negative
35210	F	8	Positive	Negative
32316	F	5	Negative	Right antrum
1495	M	3	Positive	Right antrum
25263	F	11 months	Negative	Right antrum
33515	F	2½	Positive	Negative
36241	F	1	Positive	Negative
10349	M	5	Positive	Left ethmoid and antrum
35901	M	2	Positive	Left antrum and ethmoid
33613	M	4	Negative	Left antrum and ethmoid
17	M	8 months	Negative	Maxillary sinus
1876	M	8	Positive	Negative
4656	M	2	Positive	Negative
7590	M	3	Negative	Right antrum
8052	M	6	Positive	Negative
13226	F	2	Positive	Negative
14513	F	4	Positive	Left ethmoid and antrum
14514	M	3	Positive	Negative
16780	M	5	Positive	Negative
7242	M	6	Positive	Left antrum
18432	M	5	Positive	Negative
19474	F	4	Positive	Right antrum
19475	M	6	Negative	Right antrum
22375	M	18 months	Positive	Negative
22566	F	4	Positive	Negative
25667	M	4	Positive	Left antrum
29086	M	2	Positive	Negative
29091	F	18 months	Positive	Negative
29763	M	16	Positive	Negative
29885	M	5	Positive	Ethmoid and antrum
29929	F	3 months	Negative	Pansinusitis
30058	M	15 months	Positive	Left antrum and ethmoid
30223	M	1	Positive	Negative
30464	M	3	Positive	Negative
30726	F	12	Positive	Negative
31065	M	3	Positive	Negative
31116	F	9	Positive	Negative
31217	M	8	Positive	Pansinusitis
31277	M	2	Positive	Negative
31410	M	7	Positive	Negative
31411	M	3	Positive	Negative
31420	M	9	Positive	Negative
31566	F	10	Negative	Left antrum

30 West Fifty-Ninth Street.

CITRIC ACID MILK IN INFANT FEEDING*

J. E. GONCE, JR., M.D.
AND
H. L. TEMPLETON, PH.D.
MADISON, WIS.

Because of the strikingly beneficial results obtained by the use of lactic acid milk in the artificial feeding of infants since its introduction in 1923 by Marriott and Davidson,[1] the need of a modified milk of similar qualities but of easier preparation and more constant acceptability to the infant has become apparent. The need of an acid milk that does not have to be chilled in the course of its preparation has been felt, especially by those dealing with families too poor to afford ice and with families living, as do those in farming communities, in places too remote to obtain a regular supply of ice. Even though no one type of artificial feeding can be expected to act as a panacea for all infants, an acid milk of constant acceptability is desirable. It is true that the number of infants who cannot take lactic acid milk because of vomiting is not large; nevertheless, if an acid milk that in itself never causes vomiting and yet fulfils the same requirements as lactic acid milk could be found, it would at least be an acceptable type of milk with which to feed infants.

With these ideas in mind, an investigation of citric acid as an acid with which to modify cow's milk for infant feeding was started at the Wisconsin General Hospital in September, 1928, and has continued up to the present time. This investigation has been directed at the following items: the ease of preparation; the hydrogen ion concentration of the gastric contents at the height of digestion; the size of curds at the height of digestion; the acceptability of the milk to the infant; the general progress of the infant; the character of the stools, and the presence or absence of signs of kidney irritation as expressed by urinary and blood conditions.

Although the use of orange juice milk has been in common practice in infant feeding for the past several years, no one in this country

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* This investigation was carried out through the cooperation of the Department of Pediatrics with the Department of Dairy Husbandry of the University of Wisconsin. The research was aided by a grant from C. Pfizer and Company, Inc.

1. Marriott, W. H., and Davidson, L. J.: Acidified Whole Milk as a Routine Infant Food, J. A. M. A. **81**:2007 (Dec. 15) 1923.

seems to have tried the effect of commercial, dehydrated citric acid in modifying cow's milk for infant feeding. In Germany, however, citric acid milk has been used by Weissenberg,[2] Meyer[3] and Behrens.[4] Originally in 1926, and later in 1928, Weissenberg reported excellent results from the use of citric acid milk as a routine feeding mixture in 900 cases (1928). In both reports he emphasized the low incidence of rickets in infants fed by such means. Meyer, in 1927, reported good results from the use of citric acid milk in the treatment of 70 infants suffering from diarrheal disorders. Behrens, in 1929, reported observations on 109 infants fed on citric acid milk to the effect that normal infants thrive on it, gaining in weight as rapidly as do the breast-fed infants, that infants afflicted with nutritional disturbances respond well to it and that the incidence of rickets in infants unprotected by the use of cod liver oil, irradiated ergosterol or special exposure to sunlight is much less in those fed on citric acid milk than in those fed on other artificial mixtures. The present observation duplicates several aspects of Weissenberg's work, but in addition covers other points untouched by him.

Knowing that orange juice is much easier to prepare than lactic acid milk, it was anticipated that pure citric acid could be added to boiled milk cooled to room temperature without the formation of large curds. It was found that when 4 Gm. of dehydrated citric acid is added to a quart of milk which has been boiled for five minutes and then cooled to room temperature by placing the container in a basin of running cold water, a mixture identical in appearance with lactic acid milk is obtained. The milk does not have to be chilled first, and the citric acid does not have to be added slowly in order to obtain a smooth, homogeneous mixture.

When less than 4 Gm. of dehydrated citric acid is added to a quart of milk, there is apt to be some recoagulation of the curds in the infant's stomach at the height of digestion. Because of this, 4 Gm. was taken as the ideal amount of citric acid to add to the quart of milk. Such a mixture has an average hydrogen ion concentration of 4.8 (sufficient markedly to inhibit bacterial growth of the colon, of the dysentery and of the typhoid group)[5] as compared to the average p_H of 4.2 of lactic acid milk made by the addition of 4 cc. of lactic acid to a pint of milk. This fact indicates that the buffer substance of cow's milk is not so completely saturated by the addition of 2 Gm. of dehy-

2. Weissenberg, H.: Arch. f. Kinderh. **78**:276,1926; **84**:200, 1928.

3. Meyer, Selma: Arch. f. Kinderh. **82**:241, 1927.

4. Behrens, Richard: Arch. f. Kinderh. **86**:90, 1929.

5. Shohl, A. J., and Janney, J. H.: J. d'urol. **1**:211 (April) 1917. Ohta, K.: Jahrb. Kinderh. **85**:358, 1917.

drated citric acid to a pint of milk as it is by the addition of 4 cc. of lactic acid to a pint of milk. However, the difference in the saturation of the buffer substance as between the two milks is not great. That this is true is shown by the fact that in order to increase the acidity of 100 cc. of citric acid milk from a p_H of 4.2 to a p_H of 3.75, the average p_H of the stomach contents of normal breast-fed infants at the height of digestion, it is only necessary to add 40 cc. of tenth-normal hydrochloric acid as compared to the 30 cc. of tenth-normal hydrochloric acid necessary in the case of lactic acid milk. As will be seen, the hydrogen ion concentration and the size of the curds of the gastric contents at the height of digestion of infants fed on citric acid

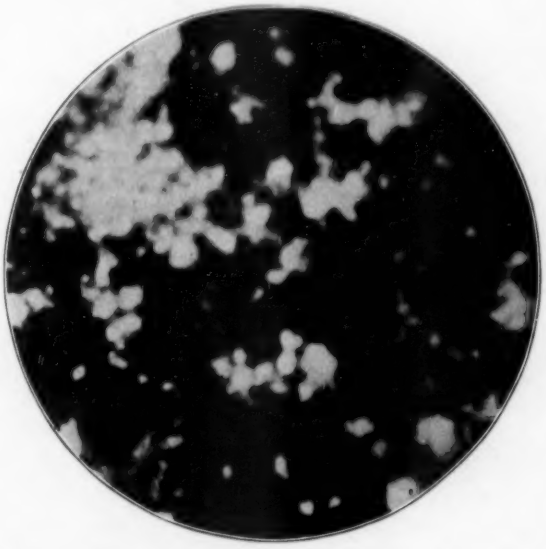

Fig. 1.—Photomicrograph of the stomach contents that were removed two hours after ingestion of whole citric acid milk prepared by adding 2 Gm. of dehydrated citric acid to each pint of milk.

milk are practically the same as in infants fed on lactic acid milk. Consequently it appears that none of the advantages of lactic acid milk in respect to these factors is lost by the difference in degree of saturation of the buffer substance as between the two milks. In addition, one might even consider it an advantage to have almost the same effects brought about by a smaller amount of foreign substance added to the milk for the infant's consumption.

In determining the hydrogen ion concentration of the gastric contents at the height of digestion of infants fed on citric acid milk, a total of 60 tests was made on 35 infants, an average of almost 2 tests on each. The average concentration in normal infants was

found to be 3.72, and in abnormal infants, 4.15. That the hydrogen ion concentration of the gastric contents at the height of digestion is a matter of as much importance as the size of the curds at the height of digestion in indicating the desirability and digestibility of any milk mixture has recently been questioned, though not denied, by Brennemann.[6] The pros and cons of this debated question are intentionally avoided here, except to mention the fact that in aspirating the stomachs of infants fed on citric acid milk, a fair amount of gastric contents can be obtained two hours after the ingestion of the milk; but the amount that can be obtained after two hours rapidly diminishes until between two and one-quarter and two and one-half hours none can

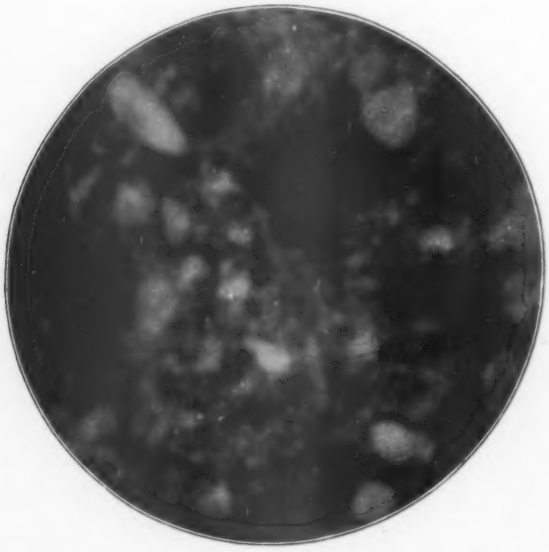

Fig. 2.—Photomicrograph of the stomach contents that were removed two hours after ingestion of whole lactic acid milk prepared by adding 4 cc. of lactic acid to each pint of milk.

be obtained, thereby probably indicating the influence of the gastric acidity in bringing about a rapid emptying of the stomach.

As already stated, 4 Gm. of dehydrated citric acid to 1 quart of milk was decided on as the optimal amount to use in acidifying cow's milk for infant feeding, because such an amount was found to be the least quantity that could be depended on in all cases to keep the curds in the infant's stomach small at the height of digestion. When the gastric contents are removed two hours after the ingestion of citric

6. Brennemann, Joseph: The Curd and the Buffer in Infant Feeding, J. A. M. A. **92**:364 (Feb. 2) 1929.

acid milk, the majority of the curds are found to measure less than 1 mm. in diameter and the largest curds, few in number, to measure not over 3 mm. in diameter. All of the curds are so soft and small that the individual curds cannot be distinguished by grasping between the fingers. As will be seen in the accompanying figures, the curds of citric acid milk at the height of digestion remain separate, and although there is some tendency for the grouping of the curds, there is no actual fusion into large curds whereas those of lactic acid milk, 4 cc. to 1 pint, are here and there definitely fused into solid curds considerably larger than the largest citric acid milk curd, the main mass of the curds, however, being about the same size as the citric acid milk curds. Figure 3

Fig. 3.—Photomicrograph of the stomach contents that were removed two hours after ingestion of whole lactic acid milk prepared by adding 3 cc. of lactic acid to each pint of milk.

shows the curds removed from a normal infant two hours after the ingestion of lactic acid milk, 3 cc. to each pint of milk, and it demonstrates strikingly that such an amount of lactic acid is not nearly so effective in preventing curd recoagulation as is either citric acid milk, 2 Gm. to 1 pint of milk, or lactic acid milk, 4 cc. to 1 pint of milk. Here again the relative merits of the case of the size of the curd in the infant's stomach are not argued except to recall the fact, as originally stated by Brennemann,[7] that all methods used in the past for the modification

7. Brennemann, Joseph, in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1923, vol. 2, p. 651.

of cow's milk for infant feeding have either wittingly or unwittingly resulted in a reduction in the size of the curd in the infant's stomach.

In water, citric acid has a decided lemon flavor, and with the addition of sugar makes a nice lemonade, but in milk the lemon flavor is much less noticeable. With amounts of corn syrup as small as 1½ ounces to a quart of citric acid milk, a mild acid tinge is momentarily left in the mouth after swallowing. With 3 ounces of corn syrup to 1 quart of citric acid milk, the flavor is extremely pleasant and the taste of acid completely obscured.

As to the acceptability of citric acid milk to the infant, the general statement may be made that citric acid milk is well taken by the general run of infants and that, in itself, it never causes persistent vomiting. Citric acid milk has been fed to 150 infants, including 100 new-born infants, in the wards of the Wisconsin General Hospital, and in all cases, in which pathologic conditions characterized by vomiting have been absent, the feedings have been well taken and retained. A few new-born infants have vomited part of the first few feedings, but even in such instances the feedings have become well tolerated and completely retained within from twelve to twenty-four hours after beginning them. To such new-born infants a mixture of 12 ounces of whole citric acid milk, 8 ounces of water and ¾ ounce of corn syrup has been used to complement the breast feedings; and in those cases remaining under observation in which artificial feedings have been continued beyond the age of 2 weeks either because of insufficient breast milk or because of weaning, the milk mixture has been gradually increased to whole citric acid milk by the age of 1 month. Previously a similar dilution of lactic acid milk, 4 cc. to a pint of milk, had been stopped as a routine measure because so many normal infants were unable to retain it well even after several days' trial. When citric acid milk was started, the difference in acceptability between the two milks to the infant was pronounced. No normal infant persisted in vomiting the citric acid milk beyond the first two or three feedings, and few infants vomited it at all. As with the new-born infants fed on lactic acid milk, older infants every now and then have been seen in the pediatric ward of the hospital who, although free from pathologic causes of vomiting, regularly vomited whole lactic acid milk as often as it was fed to them. No such trouble has been experienced with whole citric acid milk.

Beginning in September, 1928, all infants admitted to the pediatric ward of the Wisconsin General Hospital and all infants born on the obstetric service who needed complemental feedings were put on citric acid milk feedings. Aside from the observations on the acceptability of citric acid milk to the new-born infant, the chief concern of this report is with the observations on the infants admitted to the pediatric ward.

There were 50 of these infants. In age there were 4 infants under 14 days, 9 under 1 month, 6 under 2 months, 5 under 3 months, 4 under 4 months, 8 under 5 months, 5 under 8 months, 4 under 12 months, 4 under 15 months and 1 under 18 months. The primary diagnoses in this group of infants were: harelip and cleft palate, 18; clubfeet, 4; other congenital deformities, 3; simple regulation of feeding, 14; athrepsia, 2; congenital syphilis, 1; cerebrospastic paralysis, 2; acute respiratory infections, 3, and acrodynia, 3. Secondary diagnoses consisted of acute respiratory infection in 20 (including 15 cases of otitis media); diarrhea (secondary to parenteral infection) in 4; pyelitis in 1; severe secondary anemia in 7; simple dystrophy in 5; athrepsia in 4; rickets in 1; anorexia in 2; erysipelas in 1; cervical adenitis in 1, and eczema in 1.

Observation of these infants was continued for a period of at least ten days, and in several instances, such as in cases of harelip and cleft palate, through repeated admittances to the hospital, they were observed for almost a year. The average duration of observation on the ward was fifty days, and for that of 19 infants at home after discharge from the hospital, four months. Three of the infants having congenital deformities requiring frequently repeated treatments remained in the hospital for as long as from six to nine months. The routine feeding of the infants over 1 month of age consisted of whole citric acid milk with the addition of corn syrup. The amount of milk per pound of body weight taken in twenty-four hours naturally varied considerably, but under ordinary circumstances it ran between 2 and 2½ ounces. In general the infants were allowed to take whatever amounts they desired. In the case of markedly malnourished infants, amounts as great as 3 ounces per pound of body weight were taken in twenty-four hours. Infants less than 2 weeks of age were given diluted citric acid milk mixtures so as to prevent an intake of milk in excess of 2 ounces per pound in twenty-four hours. When the infant was 2 weeks old, the concentration of the formula was gradually strengthened to whole citric acid milk by the age of 1 month. The amount of carbohydrate in the form of corn syrup added to the mixture varied according to the age of the infants and according to the character of the feeding before admittance to the hospital. The initial day's feeding contained at least one tenth of the body weight in pounds expressed in ounces of carbohydrate, and the subsequent feedings contained an increasing amount of carbohydrate up to 3 ounces per quart of milk. Twenty (40 per cent) of the infants received 3 ounces per quart of milk and the remainder amounts somewhat between 1½ and 3 ounces per quart.

The feedings were invariably well taken, and the regularity with which many of the infants gained weight was unusual for hospital

patients. For example, 10 of the infants who gained weight most rapidly showed an average daily gain of 1.28 ounces during an average hospitalization period of thirty-three days. Even in the presence of acute illness, such as acute respiratory infections complicated by otitis media, and under circumstances of postoperative conditions in cases of harelip and cleft palate many continued to gain weight, whereas the actual loss of weight of any marked degree did not occur in any case. Of the entire group of 50 infants, 46 (92 per cent) gained in weight and 2 (4 per cent) remained stationary; 2 (4 per cent) lost in weight. The average gain in the hospital of the 46 infants who showed a gain in weight was 0.73 ounce per day. The average gain of 19 of the infants under observation at home after discharge from the hospital ward was 0.9 ounce per day. This satisfactory rate of gain in weight at home has been most strikingly emphasized by the fine state of nutrition of infants readmitted to the hospital for further plastic surgery after long periods at home between operations. In previous years, in spite of control of the feeding at home, it was usual to find extremely poor nutrition in infants readmitted for the repair of a cleft palate after a six months' interval at home following an operation for harelip. Ordinarily, weeks had to be spent in improving their general physical status before it was dared to subject the patient to the rigors of an operation for cleft palate. During the past six months, it has been most gratifying to find practically all patients in an excellent state of nutrition on their second admittances after periods of from four to eight months at home.

Throughout the study special attention was paid to the stools, and certain fundamental facts concerning their character and frequency determined. The most obvious fact observed is that the stools of infants fed on citric acid milk differ in character or frequency according to various conditions. New-born infants and those under 3 months of age have tended to develop loose frequent stools when fed on whole citric acid milk containing large amounts of corn syrup, such as 3 ounces to a quart of milk. On the other hand, such infants have taken from 1¾ to 2½ ounces of citric acid milk per pound of body weight in the twenty-four hours, containing one tenth of the body weight in pounds expressed in ounces of corn syrup and have had from 1 to 3 yellow, smooth, soft, pasty or firm stools daily. Six infants, all of whom were less than 6 weeks of age, have taken 3 ounces of citric acid milk per pound with the addition of from ¾ to 1½ ounces of corn syrup in the twenty-four hours without any signs of indigestion and with steady gain in weight. Infants over 3 months of age and especially those more than 4 months of age have taken from 2 to 3 ounces of corn syrup to a quart of whole citric acid milk and have had no unusual increase in the number or looseness of the stools. A few of

them actually have become constipated on such mixtures. In general, however, the stools of the infants fed on whole citric acid milk plus from 7 to 10 per cent of corn syrup have been more frequent and softer than those of infants fed on the ordinary simple dilution mixtures of cow's milk, but no more, and usually much less, frequent and soft than those of infants fed on evaporated milk mixtures containing from 7 to 10 per cent of corn syrup. The actual number of stools has varied from 1 to 3 daily, occasionally going as high as 4 stools a day in the young infant. The average daily number of stools of all infants under hospital observation during the past year, except for 4 infants who developed diarrhea for a few days secondary to acute respiratory infections, has been 1.5 stools a day. Although the number of stools has been in excess of the old standard of 1 stool a day for the artificially fed infant, there have been no evidences of the intestinal conditions being inconsistent with the general health and progress of these infants. Symptoms of dyspepsia such as vomiting, variable appetite, flatulence and colic have not been present. Aside from a few infants in whom the carbohydrate tolerance was overstepped, the stools have shown no signs of intestinal indigestion such as looseness, curds, mucus, green discoloration and excoriations of the buttocks. Whenever the tolerance for corn syrup has been exceeded, as indicated by the appearance of increased frequency or looseness of the stools, the reduction in the amount of corn syrup to the previous level has always resulted in a reduction of the frequency and an improvement in the consistency of the stools. Not infrequently a seeming intolerance to an increased amount of corn syrup has corrected itself without any reduction in the syrup. During the period of study, and especially for about four months (December to March, inclusive), acute respiratory infections, including otitis media, were often epidemic in the ward, and during this time, diarrhea developed in 4 of the 23 infants so affected. All 4 infants promptly recovered from the diarrhea following the reduction or entire removal of the corn syrup from the citric acid milk. Of the 19 infants remaining free from diarrhea, 7 were receiving and continued to receive throughout the course of the respiratory infection whole citric acid milk that contained 3 ounces of corn syrup per quart of milk. From these facts and from the fact that Meyer reported favorable results in the treatment of infants with diarrheal disorders by the use of whole citric acid milk, it appears that citric acid acts similarly to lactic acid in preventing a loss in tolerance for food, and, when lost, in restoring tolerance for it.

At the onset of the investigation the question naturally arose as to whether citric acid, in the amount used, might exert any toxic action on the kidneys. Such a possibility was considered unlikely, as Blather-

wich and Long [8] had shown by experiments with large amounts of orange juice taken by young adults over a period of four days that "it was impossible to overreach the organism's ability to oxidize the contained citric acid though the amounts drunk in one day were equivalent of about 48 Gm. of acid." However, the authors assume, by a process of deduction, that "approximately 6 per cent of the ingested citric acid appears to have escaped oxidation," even though their chemical studies of the urine seem "to render it improbable that the ingestion of large amounts of citrous fruits or fruit juices is capable of causing the production of an acid urine by overstepping the organism's ability to oxidize the organic acid or acids contained therein." Because of the assumed loss of citric acid to the extent of 6 per cent of the ingested acid, it

TABLE 1.—*Citric Acid Content of Urine Before and After Ingestion of Citric Acid*

Name and Weight in Pounds	Day of Experiment	Volume of Urine	Mg. Citric Acid Recovered from Urine	
E. B.	1	400	245	Basal diet
82	2	390	251	Basal diet
(37.2 Kg.)	3	920	12	Basal diet + 22 Gm. dehydrated citric acid in 1,000 cc. water
	4	920	5	Basal diet + 22 Gm. dehydrated citric acid in 1,000 cc. water
	5	900	5	Basal diet + 22 Gm. dehydrated citric acid in 1,000 cc. water
G. B.	1	575	176	Basal diet
77¾	2	1,800	6	Basal diet
(35 Kg.)	3	1,425	900	Basal diet + 21 Gm. dehydrated citric acid in 1,000 cc. water
	4	1,350	8	Basal diet + 21 Gm. dehydrated citric acid in 1,000 cc. water
	5	1,400	4	
W. S.	1	430	2	Basal diet
41¾	2	925	5	Basal diet
(19 Kg.)	3	1,100	30	Basal diet + 11 Gm. dehydrated citric acid in 1,000 cc. water
	4	1,025	4	Basal diet + 11 Gm. dehydrated citric acid in 1,000 cc. water
	5	1,025	4	
F. S.	1	410	34	Basal diet
48¾	2	420	60	Basal diet
(22 Kg.)	3	660	30	Basal diet + 13 Gm. dehydrated citric acid in 1,000 cc. water
	4	610	41	Basal diet + 13 Gm. dehydrated citric acid in 1,000 cc. water

was considered advisable to determine by direct examination by the methods of McClure [9] the actual amount of citric acid lost in the urine of children taking large amounts of pure citric acid. Consequently, 4 normal children, ranging in age from 7 to 12 years, after being placed on a basal diet for two days, were given 4 Gm. of dehydrated citric acid per 15 pounds (6.8 Kg.) of body weight daily for three days and the results tabulated in table 1 were obtained. This amount of citric acid, 4 Gm. per 15 pounds (6.8 Kg) of body weight, was regarded as a fair figure in representing an amount in the older children analogous to the

8. Blatherwich, N. R., and Long, M. Louisa: Studies of Urinary Acidity: I. Some Effects of Drinking Large Amounts of Orange Juice and Sour Milk, J. Biol. Chem. **53**:103, 1922.

9. McClure, W. B.: The Adaption of the Pentabromoacetone Method of the Quantitative Determination of Citric Acid in the Urine, J. Biol. Chem. **53**:357, 1922.

infant intake, as an age of 5 months, at which time the average weight is 15 pounds (6.8 Kg.), is the earliest average age at which the infant fed on citric acid milk receives 4 Gm. of citric acid daily. Although there is some question as to the absolute accuracy of McClure's method of determination of the citric acid in the urine, the foregoing results, at least, show that there is no increase in the amount of citric acid in the urine after the ingestion of the amounts used in the experiment. It also indicates that older children taking citric acid in amounts proportionate to the infant intake over a period of three days are able to oxidize large as well as small amounts of citric acid. In addition, the conclusion seems logical that under such circumstances no kidney damage could possibly occur.

However, the possibility that citric acid given over a long period of time might be different in effects than if given over a short period was considered important enough to necessitate careful study of the infants

TABLE 2.—*Results of Feeding Five Infants on Citric Acid Milk*

Name	Months of Citric Acid Milk Feeding	Diagnosis	Nonprotein Nitrogen, Mg.	Creatinine, Mg.
W. M.	9	Club feet	30.8	
R. L.	8	Congenital syphilis	31.4	
J. R.	14	Harelip—cleft palate	32.3	1.48
J. L.	6	Simple dystrophy	29.2	1.35
J. S.	9	Harelip—cleft palate	27.4	1.26

under observation for evidences of kidney damage. Consequently, routine chemical and microscopic urinalyses were made regularly on all infants, and determinations of the blood nonprotein nitrogen were made on a few from time to time. The routine urinalyses failed to reveal any consistently abnormal conditions common to all of the infants. The reactions were uniformly acid. As expected, a faint trace of albumin was found now and then, especially in the infants suffering from acute respiratory infections. The microscopic examinations showed no abnormality. Special attention was paid to the search for red blood cells, but none was found. Study of the blood chemistry showed no changes in the nonprotein nitrogen or creatinine after either short or long periods of citric acid milk feedings. The observations in the case of 5 infants fed on citric acid milk for long periods are shown in table 2.

These normal urinary and blood observations seem to indicate the absence of any nephropathic action of citric acid in the amounts used and would consequently lead to the conclusion that citric acid given over an extended period is as readily oxidized as Blatherwich and Long found it to be over a short period of time.

SUMMARY AND CONCLUSIONS

1. Citric acid milk is easy to prepare.

2. The hydrogen ion concentration of the gastric contents at the height of digestion of infants who are fed on whole citric acid milk averages 3.72 in the normal infant, and 4.15 in the abnormal infant.

3. The gastric curds at the height of digestion of infants fed on whole citric acid milk are uniformly small, the average individual curds being less than 1 mm. in diameter, and the largest being less than 3 mm. in diameter.

4. Citric acid milk is well liked by infants and never, in itself, causes persistent vomiting.

5. Infants fed on whole citric acid milk, both in the hospital and at home, gain weight with better than normal expectancy.

6. The stools of infants fed on whole citric acid milk are of a smooth pasty or firm consistency, and are somewhat more frequent in number than in infants fed on simple milk dilution mixtures.

7. Citric acid in the amounts recommended of 4 Gm. to a quart of milk is free from toxic action on the kidneys.

8. Consequently, since citric acid milk appears to equal lactic acid milk in the beneficial results, and because of its constant acceptability and ease of preparation, it is especially fitted for use in rural districts and in all homes in which ice cannot be obtained.

PRENATAL RUPTURE OF THE APPENDIX*

WILLIAM J. CORCORAN, M.D.
CHICAGO

Although the temptation is present to offer an explanation for a pathologic condition not previously reported in medical literature, no attempt will be made to go further than to set down the facts and to establish prenatal rupture of the appendix as a clinical entity.

REPORT OF A CASE

History.—Through the courtesy of Dr. A. F. Wolford, I was asked to see an infant, 48 hours old, at the Chicago Lying-In Hospital. He had a convulsive seizure toward the end of the second day, and the convulsions were recurring at frequent intervals when I was called.

The patient's mother was a unipara, aged 34, whose full term period of pregnancy was uneventful. When she was admitted to the hospital her temperature was 99 F., the pulse rate 84 and respiration 20. Her clinical course of labor was normal.

At birth the infant weighed 2,320 Gm. and was 46 cm. in height. His first temperature, taken immediately after birth, was 99 F. His skin was pink, and his cry vigorous. He was taken to the nursery in an apparently normal condition, except for the presence of what was noted by the intern, as a hydrocele. Two hours later, the infant's rectal temperature was 97.4 F.; twelve hours later it was 97.6 F.; and during the succeeding forty-eight hours it fluctuated between 97.4 and 98.4 F. He was given water at frequent intervals, put to the breast twelve hours after delivery, and thereafter at four hour intervals. He nursed well, cried loudly, and in every way acted like a normal infant during the first twenty-four hours. He passed meconium several times. Shortly after the beginning of the second day, the floor nurse noticed that he was breathing rapidly and irregularly. This she noted on the infant's record and called to the attention of the intern. The latter examined the patient but could not account for the sudden increase in respirations. Some hours later, the infant had a severe convulsion, which was followed by other seizures of a milder degree.

Examination.—At this time, I examined the patient and made the following notation on the record: "General condition critical. Skin surfaces mottled and grayish blue. Large right hydrocele. Anterior fontanel bulging. Pateller reflexes exaggerated; upper and lower extremities are held rigid. Abdomen retracted; no masses palpated. Breathing shallow and breath sounds are difficult to hear through the left chest wall; and not at all over right side; chest does not give the normal resonant note. Heart action slow and irregular. Tentative diagnosis: cerebral edema; atelectasis. Suggest: external heat to body surfaces; water by mouth at frequent intervals; breast milk given to baby with medicine dropper; 10 cc. whole blood intramuscularly."

Two hours later, the patient died. Permission was obtained for a postmortem examination, and Dr. Béla Halpert of the pathology department of the University

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of Chicago consented to perform the autopsy. The salient points of Dr. Halpert's report are as follows:

Necropsy.—The body was that of a well proportioned, full term baby boy. The skin was markedly cyanotic and slightly icteric. The remains of the umbilical cord were dry. There was an immense, rather unsymmetrical enlargement of the scrotum, which measured 7 cm. in circumference, about 6 cm. in the longitudinal and 5.5 cm. in the transverse directions. The skin of the penis was retracted, having been used up in the formation of the scrotal sac.

The peritoneal cavity contained no excessive fluid, the peritoneal surfaces showed a dirty greensh-yellow discoloration, at places deeper in color. A soft semifluid material could be scraped off here and there, but the lesser and the greater omentum, as well as the transverse mesocolon of the sigmoid, were deeper in color, which was retained in spite of washing or scraping. The diaphragm showed several parallel sagittal slits to the right of the falciform ligament. Through these slits the material escaped into the right pleural cavity; consequently the parietal surfaces of the right pleural cavity were of the same appearance as the peritoneum. The right lung had not been expanded with air. The left pleural cavity appeared normal; the surfaces were smooth and shining. The lung was partly filled with air. The right canalis inquinalis was in open communication with the cavity of the tunica vaginalis propria testis, which was much distended with gas and with the semifluid, odorless, greensh-yellow material from the peritoneal cavity. The left tunica vaginalis propria testis and also the testis and epididymis appeared normal.

A perforation the size of a pinhead was noted in the appendix on the free surface (margo liber) about 1 cm. proximal to the apex. The edges of the opening were regular; it appeared as if the mucosa had everted through the small hole, forming a bank around the opening, giving the appearance of a hole in a doughnut. It was covered with the same greenish material as the organs of the abdomen.

The dura mater and the dura sinuses appeared normal. There were no tears or hemorrhages in the falx cerebri or in the tentorium cerebelli. The leptomenix appeared slightly hyperemic and edematous. Nothing unusual was noted on the choroid plexuses, except the glomus chorioideum of both lateral ventricles, which were somewhat edematous and showed some hemorrhages. The brain itself appeared normal.

Later Dr. Halpert and I examined the specimen, shown in the accompanying figure, in his laboratory, in the hope of finding the cause of the perforated appendix. Prenatal appendicitis was eliminated because of the absence of any evidence of inflammation about the site of the rupture or elsewhere. Failure to find twisting or any mechanical malformations of the intestines would not permit a solution on a mechanical basis. A small thrombus in the ramifications of one of the small arteries leading to the side of the appendix opposite the rupture may well have been of postmortem occurrence, and even if this was not a postmortem change, the free arterial supply to the area of perforation would hardly allow a definite explanation on this basis. This was the nearest we came to an explanation.

We based our diagnosis of prenatal rupture of the appendix, as opposed to postnatal rupture, on the following facts: Normally the

communication between the canalis inguinalis and the tunica vaginalis propria testis is closed prior to birth. This was true of the left side, but the communication was open on the right because the soft semifluid material had entered the cavity of the tunica vaginalis. The distention of this cavity was clinically noted immediately at birth, and was mistaken for a hydrocele. The material, therefore, must have been present before birth. Furthermore, the right lung was collapsed and had not been distended with air. It was, in fact, still in its prenatal state, because distention of the right pleural cavity with gas and fluid had prevented its functioning at birth.

Photograph of appendix which shows well defined site of rupture.

REVIEW OF LITERATURE

A study of American and foreign literature does not reveal a similar case, although a few cases of prenatal perforation of the intestines have been reported. Breslau,[1] in 1863, recorded a case of rupture at the junction of the ascending and transverse colon. He ascribed the cause to an angulation of the cecum. Pfaff,[2] in 1899, reported a perforation of the cecum which he attempted to explain on the basis of a mechanical obstruction of the intestines due to a fixation of the large colon throughout its entire length. The ascending, transverse and descending colon were flattened against the posterior wall of the

1. Breslau: Monatschr. f. Geburtsh. u. Frauenkrankh., supp. **21**:141, 1863.

2. Pfaff: Die spontanen Darm-Rupturen bei den Neugeborenen, Inaug. Diss., Giessen, Munschow'sche Hof- und Universitätsdrukkerei, 1899.

abdomen and mechanically resisted the passage of meconium. Skiles,[3] in 1928, described a case in which the autopsy disclosed the presence of a large volvulus of the small intestine with a markedly distended bowel proximal to the volvulus, and a collapsed bowel distal to the obstruction. A healed perforation was found in the twisted loop of intestines, and the peritoneum showed evidence of what the author termed a meconium peritonitis.

In the cases here mentioned, the authors explain the intestinal rupture as following some form of mechanical obstruction. In the only other cases of prenatal rupture of the intestine which I have found recorded, the condition is not accounted for by the authors. Genersich,[4] in 1891, cited a case in which a perforation was found in the ileum, but he does not give an adequate reason for the rupture. Orth [5] reported a case of rupture of Meckel's diverticulum without venturing an explanation. And in 1912, von Sury [6] described a perforation of the rectum near the sigmoid flexure.

In reporting the clinical and pathologic observations in this case, I am well aware of the criticism which may be made because I failed to have the appendix sectioned and studied microscopically. Perhaps the real cause would have been revealed if this had been done. I would rather that the pathology department of the University of Chicago clinic preserve this specimen intact than to destroy it in an attempt to explain a condition so rare.

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3. Skiles: Prenatal Rupture of the Intestine with Subsequent Dystocia, J. A. M. A. **90**:1618 (May 19) 1928.

4. Genersich: Virchows Arch. f. path. Anat. **126**:485, 1891.

5. Orth: Lehrbuch der pathologischen Anatomie, vol. 3, p. 765.

6. Von Sury: Vrtljschr. f. gerichtl. Med., 11 supp. **43**:91, 1912.

THE CARBOHYDRATE METABOLISM OF THE NORMAL NEW-BORN INFANT

I. AVERAGE CONCENTRATION OF THE BLOOD SUGAR IN NORMAL NEW-BORN INFANTS DURING FASTING *

HARRY M. GREENWALD, M.D.
AND
SAMUEL PENNELL, M.D.
BROOKLYN

It was originally our object to study the absorption and metabolism of carbohydrates in normal, newly born infants. In reviewing the literature to determine the blood sugar content during fasting in newly born infants, we found only a meager number of reports. A study of these reports shows a rather wide variation in the technic and in the results obtained by the various investigators. It also seems to us that in most instances the number of determinations was too limited to permit conclusions. Cobliner,[1] in 1911, was the first to record blood sugar determinations for infants; these determinations, however, were made for infants from 9 to 21 days old. He employed the Bertrand method and found an average value of 0.085 per cent. Götzky [2] made determinations with the Bang micromethod on a number of newly born infants and found an average of 0.085 per cent. From his observations, he recorded that the blood sugar content increases rather rapidly from the first day of life to the end of the first week, after which a gradual decrease takes place (table 1).

Mogwitz,[3] in 1914, was probably the first to determine the blood sugar during fasting in newly born infants ranging from 7 hours to 3 weeks in age; he reported values which varied from 0.070 to 0.103 per cent. Cannata,[4] employing the Lewis Benedict method, made determinations for newly born infants during the first twenty-four hours of life, and reported values of from 0.074 to 0.100 per cent. Sedgwick and Ziegler,[5] employing the Folin-Wu method, reported determinations for infants from 3 to 43 days old. A total of fifty-one determinations were made, forty-four of which were for infants from 3 to 10 days old.

* Submitted for publication, Oct. 19, 1929.

* From the Pediatric Service of the United Israel Zion Hospital.

1. Cobliner: Ztschr. f. Kinderh. **1**:207, 1910.
2. Götzky: Ztschr. f. Kinderh. **9**:44, 1913.
3. Mogwitz: Monatschr. f. Kinderh. **12**:569, 1914.
4. Cannata: Pediatria **25**:513, 1917.
5. Sedgwick, J. P., and Ziegler, M. R.: The Nitrogenous and Sugar Content of the Blood of the New-Born, Am. J. Dis. Child. **19**:429 (June) 1920.

They reported a range of from 0.070 to 0.110 per cent. Lucas [6] and his co-workers, with the Folin-Wu method, determined the blood sugar values for infants from 1 to 12 days old and reported values ranging from 0.52 to 0.093 per cent. Nystén,[7] with the Bang micromethod, made fifteen determinations for infants from 1 to 5 days old and reported values of from 0.085 to 0.118 per cent with an average of 0.101 per cent. He stated that, in general, the blood sugar content was higher in infants than in adults, and that the average for the first five days of life

TABLE 1.—*Fasting Blood Sugar Values Obtained by Various Investigators*

Author	Age, Days	Sugar, Percentage	Number of Analyses	Average for First Five Days, Per Cent
Götzky	1	0.072	?	
	2	0.083	..	
	3	0.078	..	
	4	0.085	..	
	5	0.099	..	
	6	0.102	..	
	7	0.088	..	
	8	0.082	..	
	9	0.077	..	
	10	0.086	..	
	11	0.076	..	
	12	0.077	..	0.085
Sedgwick and Ziegler	3	0.07	4	
	4	0.09	4	
	5	0.07	11	
	6	0.08	8	
	7	0.08	5	
	8	0.09	5	
	9	0.09	4	
	10	0.07	3	0.080
Lucas et al.	1	0.066	?	
	2	0.051	..	
	3	0.068	..	
	4	0.082	..	
	5	0.064	..	
	6	0.078	..	
	7	0.077	..	
	8	0.085	..	
	9	0.078	..	
	10	0.077	..	0.073
Nystén	1	0.096	6	
	2	0.101	3	
	3	0.097	2	
	4	0.110	2	
	5	0.102	2	0.101
Brown	?	?	?	0.087

was 0.1 per cent; in older children he found an average of 0.123 per cent, whereas in adults, he found the average to be 0.93 per cent.

Brown [8] obtained values ranging from 0.072 to 0.097 per cent with an average of 0.087 per cent in infants less than 2 weeks old. She stated that the blood sugar concentration is lower at this period than

6. Lucas, W. P.; Dearing, B. F.; Hoobler, H. R.; Cox, A.; Jones, M. R., and Smyth, F. S.: Blood Studies in the New-Born, Am. J. Dis. Child. **22**:525 (Dec.) 1921.

7. Nystén: Acta paediat. **1**:79, 1921.

8. Brown: Quart. J. Med. **18**:175, 1925.

at any other time. She used the McLean method but did not say how many infants were examined nor how many determinations were made.

It was therefore thought advisable to make a greater number of determinations in a larger series of cases to see whether we could establish an average blood sugar content during fasting in newly born infants and to compare our observations with those of previous investigators. This paper will deal only with data obtained in this investigation, and in a subsequent paper will be reported the effect of the ingestion of definite amounts of dextrose, lactose, sucrose and dextrimaltose on the blood sugar content of healthy, newly born infants.

Ninety-four infants, ranging from 1 to 10 days in age, were examined, and a total of 191 determinations were made. These determinations were made at least three hours after a previous feeding. Although Tisdall, Drake and Brown [9] question the accuracy of determinations made three hours after nourishment, and write that in certain cases an interval of over three hours was required for the blood sugar to return to the original value, it has been our experience that, for newly born infants at least, an interval of three hours is sufficient. In a number of determinations for breast-fed, newly born infants made at half hour intervals after a breast feeding, we found fasting values, with but few exceptions, at the end of two hours. Even in the few cases in which the blood sugar content had not reached the fasting level at two hours, the curve already showed a downward trend.[10]

The method employed in this test, was a Folin micromethod recently described.[11] This method requires but 0.1 cc. of blood from which two sugar determinations can be done. The method was checked with dextrose solutions of various strengths and was found to be accurate.

A comparison of the results obtained by this method with those obtained by the Folin-Wu method was made; the comparison was found to be similar to that of Folin.[11] All the samples of blood were examined immediately so that the question of glycolysis does not enter here.

TECHNIC

Two of the special 0.1 cc. pipets for taking specimens, described by Folin, were used throughout the entire work. One set of pipets was used in making the entire series of determinations, each pipet being marked and used only for its designated solution. To obtain the blood specimens, the great toe was carefully cleaned with alcohol and allowed to dry. The tip of a round-bellied Bard-Parker blade, previously cleaned with alcohol, was thrust deeply into the end of the toe. In this

9. Tisdall, F. F.; Drake, T. G. H., and Brown, A.: The Carbohydrate Metabolism of the Normal Infant, Am. J. Dis. Child. **30**:675 (Nov.) 1925.

10. Greenwald and Pennell: The Carbohydrate Metabolism of the Newborn Infant, to be published.

11. Folin: J. Biol. Chem. **77**:421, 1928.

manner, a small but deep cut was made from which the required amount of blood flowed easily and quickly in most instances. When the blood was slow in coming, the child was held by the assisting nurse in an erect position. This greatly enhanced the flow, and it was never necessary to exert pressure. If other samples were taken later, no new puncture was found necessary. A brisk rubbing of the old puncture sufficed. Table 2 is a summary of the values obtained.

TABLE 2.—*Fasting Blood Sugar Content in Normal Infants*

Age, Days	Extremes	Average	Number of Determinations
Less than 24 hours	0.062-0.083	0.071	20
1	0.064-0.087	0.074	28
2	0.062-0.087	0.074	27
3	0.060-0.095	0.074	19
4	0.064-0.095	0.074	24
5	0.060-0.095	0.076	20
6	0.065-0.095	0.079	15
7	0.062-0.100	0.073	9
8	0.060-0.100	0.082	16
9	0.074-0.095	0.082	6
10	0.064-0.087	0.074	3
11	80	0.080	1
12	80	0.080	1
13	100	0.100	1

General average, 0.076 per cent.

RESULTS

The values found by us closely parallel those of Sedgwick and Ziegler [5] and Lucas,[6] who worked with venous blood obtained from the longitudinal sinus. The values we obtained are definitely lower than those obtained by Brown, Nystén, Götzky and Mogwitz (table 1). Our observations do not bear out those of Götzky that the blood sugar content increases from the first to the seventh day of life, and then decreases. Our figures show rather that there is a slow but definite increase from the first to the thirteenth day. The lowest value obtained was 0.060 per cent; the highest, 0.1 per cent. It may be of interest to note here that in one infant not included in this series, a low value of 0.044 per cent was obtained. This infant subsequently died of bilateral suprarenal hemorrhages; the drop in the blood sugar content preceded the clinical signs by at least forty-eight hours. This case will be reported in detail by Dr. M. B. Gordon. Determinations of the blood sugar content in older infants by Tisdall, Drake and Brown [9] showed 0.085 per cent; by Bass,[12] in children from 2 to 14 years old, an average figure of 0.091 per cent. Frank and Melhorn,[13] in children 2 years old, found an average value of 0.086 per cent. It is evident, therefore, that during the first two weeks of life the starving blood sugar content is at a distinctly lower level than at any later period. As a result of our work and because of the close approximation of our figures with those of Sedgwick and Ziegler [5] and Lucas and his co-workers,[6] whose series were larger than those of other observers, we

12. Bass, quoted by Tisdall, Drake and Brown (footnote 9).

13. Frank and Melhorn, quoted by Tisdall, Drake and Brown (footnote 9).

consider the normal average range of blood sugar concentration in newly born infants to be from 0.071 to 0.08 per cent.

Because of the rather wide variations in the values obtained, comparative studies of weight and blood sugar percentage were made on

TABLE 3.—*Relation of Weight to Fasting Blood Sugar Content*

Infant Number	Age, Days	Weight	Blood Sugar, Percentage
1	8	5 pounds, 5 ounces	0.071
2	2	6 pounds	0.077
3	1	6 pounds, 9 ounces	0.074
4	2	6 pounds, 11 ounces	0.066
5	14 hours	7 pounds	0.074
6	1	7 pounds, 4 ounces	0.087
7	1	7 pounds, 8 ounces	0.077
8	1	7 pounds, 9 ounces	0.069
9	2	7 pounds, 10 ounces	0.077
10	6	7 pounds, 15 ounces	0.087
11	1	8 pounds	0.083
12	18 hours	8 pounds, 1 ounce	0.060
13	1	8 pounds, 8 ounces	0.071
14	2	9 pounds, 11 ounces	0.087
15	1	10 pounds, 13 ounces	0.077

TABLE 4.—*Relation of Loss in Weight to Blood Sugar Content*

Age, Days	Weight	Blood Sugar, Percentage
3	7 pounds, 4 ounces	0.066
4	7 pounds, 3 ounces	0.071
8	7 pounds, 2 ounces	0.100
9	7 pounds, 1 ounce	0.091

TABLE 5.—*Relation of Gain in Weight to Blood Sugar Content*

Age, Days	Weight	Blood Sugar, Percentage
3	7 pounds, 7 ounces	0.083
4	7 pounds, 9 ounces	0.069
5	7 pounds, 10 ounces	0.087
6	7 pounds, 11 ounces	0.074
9	7 pounds, 12 ounces	0.077

TABLE 6.—*Relation of Loss and Gain in Weight to Blood Sugar Content*

Age, Days	Weight	Blood Sugar, Percentage
9 hours	9 pounds, 8 ounces	0.074
1½	9 pounds, 5 ounces	0.077
2½	9 pounds, 4 ounces	0.080
3½	8 pounds, 15 ounces	0.066
4½	9 pounds, 2 ounces	0.083

fifteen infants to determine whether the weight was a factor in the blood sugar concentration (table 3).

It is apparent from the results in table 3 that no relation exists between the weight and blood sugar concentration; for example, infant no. 1, whose weight was 5 pounds 5 ounces (2,500 Gm.) had a blood

sugar content during fasting of 0.071 per cent, whereas, infant no. 15, who weighed 10 pounds 13 ounces (4,904.5 Gm.) had a blood sugar content of 0.077 per cent.

Another series of nineteen infants was studied to determine if changes in weight were accompanied by changes in the blood sugar concentration. The blood sugar content during fasting was determined in each infant at the same time each morning for five successive days (from the third to the seventh day of life, inclusive) and compared with the weight curve during this period. Seven infants showed a loss

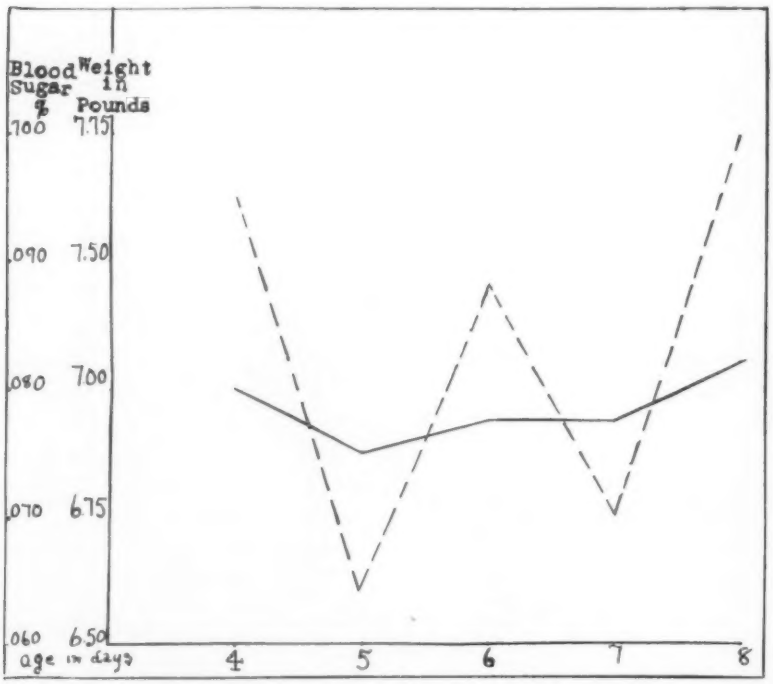

Chart 1.—Relation of changes in weight to the fasting blood sugar content. The broken line designates the percentage of blood sugar; the unbroken line, the weight.

in weight; four, a gain, and six, first a loss and then a gain. Only three tables (4, 5 and 6), one representative of each group, are shown here, since the results were practically the same in all.

No relation exists between the variation in the weight and the blood sugar concentration. In table 4 it will be seen that, although there was a daily loss of 1 ounce for four consecutive days, the blood sugar concentration actually increased from 0.066 to 0.100 per cent. Similarly, it can be seen from table 5, which is representative of the infants who gained in weight steadily, that the regular increase in weight was not accompanied by a regular increase in blood sugar concentration.

SUMMARY

1. One hundred and ninety-one determinations on ninety-four normal newly born infants were made to determine the average concentration of the blood sugar during fasting. The Folin micromethod recently described was employed.

2. The lowest value obtained was 0.060 per cent and the highest, 0.100 per cent; the general average was 0.076 per cent.

3. There is no relation between the weight and the blood sugar concentration; the blood sugar content may be as high or as low in an infant weighing 5 pounds (2,300 Gm.) as in one weighing 10 pounds (4,500 Gm.).

4. There is no relation between variations in weight and the blood sugar concentration. An increase in weight is not necessarily accompanied by an increase in the blood sugar content; nor is a lowering of the weight curve necessarily paralleled by a drop in the blood sugar.

BISMUTH THERAPY EXCLUSIVELY IN CONGENITAL SYPHILIS *

JOHN F. COPPOLINO, M.D.
PHILADELPHIA

Congenital syphilis has always been refractory to treatment. The fact of its resistance creates a situation by which, when compared to acquired syphilis, its prognosis is relatively unfavorable. As a result, adverse criticism is often directed against the use of drugs in the treatment of patients with congenital syphilis. Both comparison and criticism are obviously unfair, since it is recognized that in acquired syphilis the earlier the treatment the greater possibility of cure. It is fallacy, therefore, to expect the same favorable results when dealing with congenital syphilis, which is invariably of long duration, the new-born infant not excepted, since the disease has been present for months in utero.

To compare the relative value of drugs used in both forms of syphilis, it should be determined whether the disease has been present in each type for the same length of time. If this is done, the dismal outlook so frequent when evaluating a new drug might be brightened, and there would be less possibility of relegating that drug which may have proved to be a valuable remedy.

Since the introduction of bismuth as an antisyphilitic agent much has been written of its use in acquired syphilis, but comparatively little concerning its value in the congenital form. Because of this paucity of literature, I feel justified in reporting a relatively small series of cases. It is perhaps a factor of additional interest to consider that the vast majority of previous reports are based on cases in which patients had either previous treatment with arsenic and mercury or these drugs had been used concurrently with bismuth, while in my series of cases, bismuth was the only medication the children received.

Bismuth was first used in children by Muller [1] in 1922, who reported his observations in six cases. Cajal [2] and Spierer used it in 1923. They reported that arsphenamine healed the lesions as quickly; that mercury healed them more rapidly, and that the ultimate result was obtained more slowly with bismuth than with arsenic. Lees,[3] in 1924, reported

* Submitted for publication, Oct. 12, 1929.

* From the Department of Pediatrics, Jefferson Medical College.

1. Muller, quoted by Wright, Carrol S.: Bismuth in Treatment of Congenital Syphilis, J. A. M. A. **89**:424 (Aug. 6) 1927.

2. Cajal, M., and Spierer, H.: Presse méd. **31**:354 (April 18) 1923.

3. Lees, David: Edinburgh M. J., May, 1924, p. 94.

that, in his belief, bismuth was more potent than mercury. He began by giving a patient a dose of 15 mg. every fifth day, and he gradually increased the dose. Stoye [4] reported the treatment of twenty-eight children with insoluble bismuth salicylate, subsalicylate and hydroxide. Intragluteal injections were made at two or three day intervals. He administered from fifteen to twenty injections, the dose varying from 10 to 20 mg. in infants, to 35 mg. in children up to 3 years of age. He observed infiltration of tissue around the site of injection in from 30 per cent to 40 per cent of cases. He reported general favorable results. Tudos,[5] in 1925, stated that pain was considerably less with injections of bismuth than with injections of mercury, and that only 4 cases of 115 showed albuminuria and epithelial cells. Southby,[6] in 1927, reported a series of cases in which the results were favorable, especially in young infants. Wright,[1] a little later, reported favorable experience with its use. Other contributions have been made, and it is the general opinion that bismuth is a more potent drug than mercury but not so good or so rapid in its action as arsenic. To these reports I wish to add the experience I have had with the exclusive use of bismuth for the past three and one-half years.

The preparation used was bismuth salicylate in oil suspended together with camphor and creosote, 1 cc. of which contains 130 mg. of metallic bismuth. In my earlier cases I started with a dose of from 15 to 30 mg. in young infants, and 65 mg. in older children. It was observed that no ill effects followed, and the dose was increased to 65 mg. for children under 1 year of age, and to 130 mg. in older children.

The course of treatment consisted of twenty injections at weekly intervals. A blood test was taken at the beginning and termination of each course, and if it was positive, the treatment was immediately continued; if negative, a four weeks' rest was allowed. The maximum number of courses administered was three, after which the patients returned every month for examination and blood tests.

TECHNIC OF INJECTION

Briefly, the most important points are: 1. Asepsis should be observed. 2. The injection is given alternately and deeply into the upper and inner quadrant of each buttock. 3. Care must be exercised that a blood vessel is not encountered as evidenced by drawing blood into the syringe. 4. After the injection has been made, the syringe is disconnected from the needle, which is left in situ. Air is drawn

4. Stoye, W.: München. med. Wchnschr. **31**:1431 (Oct.) 1924.
5. Tudos, Andreas: Jahrb. f. Kinderh. **108**:236 (April) 1925.
6. Southby, Robert: M. J. Australia **1**:357 (March 12) 1927.

into the syringe and injected. This clears the canal made by the needle of any bismuth that may be forced back, especially if the muscles contract. The needle is then withdrawn, firm pressure applied and the part massaged. If this is done, then infiltration and induration previously reported will be reduced to a minimum.

COMPLICATIONS

Various authors reported complications, such as abscesses, gangrene of the buttocks and gangrenous stomatitis. Toxic symptoms have also been noted, such as blue lines on the gums, stomatitis, nausea and vomiting, gastro-enteritis and albuminuria. With the exception of pathologic observations in the urine, there were no undesirable reactions. In all cases transitory albuminuria was found, while in two instances a few casts and epithelial cells were noted, and in one case a positive benzidine reaction was reported. In the latter instance only was treatment suspended. In all other cases, the pathologic observations in the urine disappeared. On three occasions sugar was found, but this, too, disappeared without suspension of treatment.

RESULTS

In the present series, twenty-six children were treated, but as in other clinics, I had great difficulty in persuading the patients to return for further treatment, so that only twelve children received one or more courses, and in several of these, treatment was interrupted from one to eight weeks during a course.

The patients may be divided into two groups, those under 1 year of age (table 1) and those over 1 year (table 2). In the first group of patients, the age range was from 2 months to 1 year. The symptoms present at the beginning of treatment were, in three cases, coryza, a secondary rash and mucous patches, and in one of these, also, an enlarged spleen. In one case, there were coryza, dactylitis and pseudoparalysis, with considerable destruction at the lower end of the radius and ulna. In the fifth case, there were no symptoms. In all cases, the Wassermann reaction was plus 4. Two patients received three courses of treatment, one two courses, one one course and the fifth an incomplete course. In two cases in which the patients were given small doses, the lesions were completely healed after the seventh and tenth injections; in the other two cases, with the use of larger doses, the lesions were completely healed after the fourth injection. At the end of the first course, the Wassermann reaction was negative in two cases; in one, plus 2; and in the fourth, plus 1. In the former case, the patient received small doses of bismuth while in the latter case the course was interrupted for eight weeks. After the second course, the Wassermann reaction became negative in both instances. In two cases, the patients

have remained symptom-free and serologically negative for from eighteen months to two years. The third patient is still under treatment, but continues to have a negative reaction.

In the second group, the symptoms present in two patients were interstitial keratitis; in one patient, a punched-out, kidney-shaped ulcer situated in the upper third of the right thigh; in one, periostitis involving the tibiae and right femur; in one, mental deficiency. Three had no

TABLE 1.—*Effect of Bismuth Therapy on Congenital Syphilitic Patients Under 1 Year of Age*

Case Number	Age	Symptoms	Wassermann Reaction	Course of Treatments	Results	Wassermann Reaction
I	2 months	Coryza; pseudoparalysis; dactylitis; roentgen ray: considerable destruction of lower end of radius and ulna	+4	(1) 10 injections (15 mg.)	After third injection began to move wrists and dactylitis to subside; healed after tenth injection	—
				(2) 20 injections (65 mg.) Interrupted	No symptoms	—
				(3) 20 injections (65 mg.) Interrupted	No symptoms for two years	—
II	4 months	Coryza; secondary rash—mucous patches	+4	(1) 20 injections (32 mg.)	After seventh injection, lesions completely healed	+2
				(2) 20 injections (65 mg.)	No symptoms	—
				(3) 20 injections (65 mg.)	No symptoms for eighteen months	—
III	2 months	Emaciation; coryza; mucous patches; desquamation of hands and feet	+4	(1) 20 injections (65 mg.)	After fourth injection lesions entirely healed; weight stationary for four weeks; then gained 8 ounces weekly	— Child left town
IV	1 year	No symptoms; both parents positive	+4	(1) 20 injections (65 mg.) Interruption for eight weeks	No symptoms	+1
				(2) 20 injections (65 mg.) Interrupted —pertussis	No symptoms	—
V	2 months	Secondary rash; enlarged spleen	+4	(1) 10 injections (65 mg.)	Lesions healed after fourth injection; spleen not palpable	Not taken; left town after 10th injection

symptoms. In all cases the Wassermann reaction was plus 4, except in two, in which the reaction was plus 1. The parents of these children were syphilitic. In three, patients received three courses; four, two courses; and one, one course.

In one case, in which a small dose was used, the interstitial keratitis was completely healed after the tenth injection. In this instance, only one eye was involved, but during the course of treatment the other eye became affected to a lesser degree. In the other case of keratitis, less improvement was noted at the end of the second course, even though a larger dose was used. In the first case, the Wassermann reaction

became negative after the first course, while in the latter, it was plus 1 at the end of the first and plus 3 at the end of the second course.

The periostitis was completely healed by the twelfth injection, when small doses were used; the ulcer was completely healed after the fourth

TABLE 2.—*Effect of Bismuth Therapy on Congenital Syphilitic Patients Over 1 Year of Age*

Case Number	Age	Symptoms	Wassermann Reaction	Course of Treatments	Results	Wassermann Reaction
VI	10 years	High grade keratitis of the right eye; no lesion of left eye	+4	(1) 20 injections (65 mg.)	Keratitis completely healed by tenth injection; left eye became involved at the third injection but to a lesser degree	— Left town
VII	9 years	Periostitis involving tibiae and right femur	+4	(1) 20 injections (65 mg.)	Periostitis; completely healed by twelfth injection	+3
				(2) 20 injections (65 mg.)	No symptoms	+3
				(3) 20 injections (130 mg.)	No symptoms	— 4 weeks later +2
VIII	7 years	Poor mentality	+4	(1) 20 injections (130 mg.)	Some improvement in mentality	+4
				(2) 20 injections (130 mg.)	Mentality same	+4
				(3) 20 injections (130 mg.)	Same	+4
IX	7 years	Punched-out kidney-shaped ulcer 2½ in.x1¼ in.	+4	(1) 20 injections (130 mg.)	Ulcer completely healed at the fourth injection	+4
				(2) 20 injections (130 mg.)	No symptoms	+4
				(3) 20 injections (130 mg.)	No symptoms	+2 Left town
X	6 years	No symptoms; mother's Wassermann reaction +4	+4	(1) 20 injections (130 mg.)	No symptoms	+2
				(2) 20 injections (130 mg.)	No symptoms	— Left town
XI	9 years	Marked keratitis of both eyes	+4	(1) 20 injections (130 mg.)	Improved	+1
				(2) 20 injections	Improved	+3
XII	8 years	No symptoms; both parents syphilitic patients	+1	(1) 20 injections (130 mg.)	No symptoms	—
				(2) 20 injections	No symptoms	—
XIII	9 years	No symptoms; mother's Wassermann reaction +4	+1	(1) 20 injections (130 mg.)	No symptoms	—
				(2) 20 injections (130 mg.)	No symptoms	—

injection when twice the dose was used. In the former case, the Wassermann reaction became negative at the end of the third course, but it was plus 2 after treatment was suspended for four weeks. In the latter case, the reaction was plus 2 after the patient had had three courses. In the fifth case the child's behavior was slightly improved while the Wassermann reaction remained unchanged after three courses. In the three symptom-free patients, the Wassermann reaction became negative

in two after the first course and remained so. These, however, gave plus 1 reactions when the treatment was begun. The last case gave a plus 2 reaction after the first course and negative reaction after the second course. The child left town.

CONCLUSIONS

1. Bismuth in rather large doses is apparently well tolerated by infants and children.

2. It is useful in the treatment of older children, but does not effect cure.

3. It is most efficacious in young infants, rendering them both symptom-free and serologically negative.

4. No absolute valuation of the drug can be made at the present time. I believe these cases should be followed for several years to determine the permanency of results.

ANTIMEASLES DIPLOCOCCUS SERUM (TUNNICLIFF) *

M. G. PETERMAN, M.D.
MILWAUKEE

A review of the literature on the prevention of measles was reported in July, 1928.[1] At this time there were presented the results of the prophylactic inoculation with antimeasles diplococcus serum (Tunnicliff) of children exposed to measles. Thirty-one of thirty-four children inoculated on or before the fifth day after exposure did not develop measles. Three children inoculated on or before the fifth day developed the disease in a modified form.

Other favorable reports have appeared concerning the use of Tunnicliff's serum since my previous publication on this work. Halpern reported twenty-eight of forty-five patients, or 63 per cent, successfully protected.[2] Hoyne considered the serum a reliable prophylactic if given within three days after exposure.[3] Hoyne and Peacock reported forty-three children inoculated within four days after exposure who did not develop the disease; thirty-eight children inoculated on the fifth day or later developed the disease, but in 81.5 per cent it was modified. Twenty-seven children who did not receive the serum contracted the disease.[4]

Ferry and Fisher, who in 1925 isolated a streptococcus of the *viridans* type from the blood of patients with measles,[5] have with others, observed the results of immunization of children with a measles antitoxin produced by the injection of horses with their *"Streptococcus morbilli."* With an adequate dosage, these investigators reported 88 per cent protection in twenty-six children exposed to the disease. In the total group

* Submitted for publication, Oct. 18, 1929.

* From the Department of Pediatrics, Marquette University, and the Milwaukee Children's Hospital.

1. Peterman, M. G.: Prevention of Measles, Am. J. Dis. Child. **36**:123 (July) 1928.

2. Halpern, L. J.: Prevention and Modification of Measles by Measles Diplococcus Goat Serum, J. A. M. A. **90**:1109 (April 7) 1928.

3. Hoyne, A. L.: Prevention of Measles; Some Results with Use of Tunnicliff's Immune Goat Serum, Illinois M. J. **53**:114 (Feb.) 1928.

4. Hoyne, A. L., and Peacock, S.: Prevention and Modification of Measles with Antimeasles Diplococcus Goat Serum, Am. J. Dis. Child. **35**:1021 (June) 1928.

5. Ferry, N. S., and Fisher, L. W.: Measles Toxin, Its Preparation and Application as Skin Test as Immunizing Agent and for Protection of Antitoxin, J. A. M. A. **86**:932 (March 27) 1926.

of seventy children, the average protection with antitoxin was 66 per cent.[6]

In view of the reports in the literature of carefully controlled studies by competent persons, it is difficult to understand the conclusions of Silverman that the "animal serums" of Ferry "showed no evidence of value in measles." In his report, he stated: "In the first tests with Ferry's serum, one child came down with the first symptoms of the disease the day the serum was given and another child showed the

TABLE 1.—*Data on Thirty-Nine Patients Who Received Antidiplococcus Goat Serum*

Patient	Sex	Age	Serum, Cc.	Days After Exposure	Serum Reaction
D. W.	M	8 months	6	4	None
F. C.	M	6 months	6	4	None
M. F.	F	10 months	6	4	None
J. R.	M	20 months	6	4	None
W. L.	M	4 months	6	5	None
R. T.	M	18 months	6	5	None
F. M.	M	9 years	6	2	None
H. L.	M	15 months	6	5	None
R. S.	M	8 months	6	5	None
E. O.	M	8 months	6	5	None
J. F.	M	2½ years	6	3	None
J. V.	M	10¾ years	6	3	None
R. S.	M	8½ years	6	3	None
I. K.	M	12½ years	6	3	None
C. K.	M	10½ years	6	3	None
L. S.	F	14 months	6	3	None
M. B.	M	9¾ years	6	3	None
V. G.	M	8½ years	6	3	None
L. M.	F	4½ years	6	3	None
H. B.	F	7½ years	6	3	None
D. G.	M	8 years	6	3	None
L. T.	M	8 years	6	3	Slight
C. S.	F	15 months	6	3	None
D. S.	F	7 months	6	4	None
F. C.	F	15 months	6	4	None
N. D.	M	10 months	6	5	None
D. N.	F	12 months	6	4	None
L. K.	M	8 months	6	4	Mild
D. R.	M	8 months	6	4	Moderate
W. H.	M	12 months	5	5	None
D. B.	F	8 months	6	4	None
H. W.	M	12 months	6	4	None
R. S.	M	10 months	6	4	None
B. D.	F	21 years	7	4	Slight
F. C.	F	21 years	7	4	None
R. D.	F	23 years	6	4	None
L. R.	F	20 years	7	4	None
A. G.	F	22 years	7	4	None
R. D.	F	20 years	7	4	None

symptoms four days later." Two children given the serum three and five days, respectively, after exposure, developed a severe case of measles.[7] Later, Silverman[8] reported that only four children were given Ferry's serum; one developed measles four days later and one the same day after injection. Then he concluded that "it is obvious

6. Ferry, N. S.: Clinical Results with Measles, Streptococcus Toxin and Antitoxin, J. A. M. A. **91**:1277 (Oct. 27) 1928.

7. Silverman, A. C.: Serum Prophylaxis in Measles Epidemic, J. A. M. A. **91**:1786 (Dec. 8) 1928.

8. Silverman, A. C.: Immunization with Modified Toxin, Am. J. Dis. Child. **37**:957 (May) 1929.

that my experience with the Ferry serum does not show any definite evidence of its value." The statement is true, but it is no reflection on the value of Ferry's serum. The dosage used was not mentioned. However, this is not necessary since it is obvious that any prophylactic

TABLE 2.—*Data on Eleven Children Who Received Antimeasles Diplococcus Horse Serum* *

Patient	Sex	Age	Serum, Cc.	Days After Exposure	Serum Reaction
J. G.	F	20 months	5	4	None
W. B.	M	6 months	5	4	None
D. Z.	M	1 month	5	4	None
D. R.	F	5 years	6	4	None
B. B.	F	4½ years	5	5	None
K. B.	M	3½ years	6	5	Moderate
R. B.	M	5 years	6	4	None
H. E.	F	10½ years	6	5	Severe
S. M.	M	6 years	6	5	Moderate
V. N.	F	3 months	5	5	None
R. C.	M	6 months	5	4	None

* Squibb's concentrated horse serum was used.

TABLE 3.—*Data on Eleven Children Who Received Antidiplococcus Goat Serum*

Patient	Sex	Age	Serum, Cc.	Days After Exposure	Serum Reaction	Measles Days After Serum	Severity	Complications
W. M.	M	21 months	6	4	None	19	Usual	None
D. N.	F	9 months	5	4	None	9	Mild	None
D. S.	M	2½ years	5	2	None	14	Mild	None
J. M.	M	4½ years	6	3	None	13	Usual	None
J. P.	M	5 years	6	3	None	8	Usual	None
G. Z.	M	15 months	6	4	None	19	Usual	None
R. D.	M	2 years	6	7	None	2	Usual	Otitis media
R. D.	M	6 years	6	3	None	14	Usual	None
W. S.	M	12 months	6	4	None	14	Usual	None
D. R.	F	10 months	6	5	None	8	Mild	None
C. B.	F	4 years	6	4	None	14	Usual	Otitis media

TABLE 4.—*Data on Eight Children Who Received Antimeasles Diplococcus Horse Serum* *

Patient	Sex	Age	Serum, Cc.	Days After Exposure	Serum Reaction	Measles Days After Serum	Severity	Complications
H. Y.	M	9 months	5	4	None	16	Mild	None
S. N.	F	18 months	5	4	None	20	Uusal	None
D. B.	M	15 months	5	?	None	Same	Usual	None
H. J.	M	21 months	5	4	None	15	Mild	None
H. M.	M	5½ months	5	4	None	15	Mild	None
V. N.	F	6 months	5	4	Moderate	18	Usual	None
A. B.	M	18 months	5	4	None	28	Usual	None
J. J.	F	15 months	5	3	None	25	Mild	None

* Squibb's concentrated horse serum was used.

serum given "on the day of the first symptoms of disease" would necessarily "show no evidence of value." Tunnicliff insisted on an adequate dosage of serum to be given within the first three days after exposure; Ferry stated that "the best results were obtained when it (the antimeasles serum) was injected at the time of, or soon after, exposure." [9]

9. Ferry, N. S.: Personal communication to the author.

In November, 1928, measles developed in the Milwaukee Children's Hospital in association with a widely prevalent epidemic in the community. There were 829 cases reported in Milwaukee during 1928; 185 occurred in November and 454 in December, with no deaths. In the first six months of 1929, 13,058 cases were reported in a population of 580,000. The fatality or death rate per hundred cases was 0.17.[10] The disease was not severe, but the morbidity was very high.

The results obtained with antimeasles diplococcus (Tunnicliff) goat and horse serum[11] are presented in the tables. Sixty-one children and six nurses, with no previous history of measles received the serum on or before the fifth day after exposure. In addition, one boy whose day of exposure was not known developed measles the day he received the injection (table 4). Another developed the disease two days after the injection of serum (table 3). Obviously these two are not included in my statistics. Thirty-three children and six nurses who received from 5 to 7 cc. of antimeasles diplococcus goat serum did not develop measles (table 1). Eleven children who received antimeasles diplococcus horse serum did not develop the disease (table 2). Eleven children who received antimeasles diplococcus goat serum developed measles (table 3). In one of these, the rash appeared two days after injection. Eight children who received antimeasles diplococcus horse serum developed measles (table 4). One of these developed the rash on the day of injection. There were four moderate serum reactions and one severe.

Seventy-seven persons, six adults and sixty-one children, with no previous history of measles, were given antimeasles diplococcus goat or horse serum (Tunnicliff) within five days after exposure to the disease. Seventeen children developed the disease; fifty persons were protected, which shows a percentage of 74.6.

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10. French, M. R.: Personal communication to the author from the Milwaukee Health Department.

11. Supplied by Dr. Ruth Tunnicliff.

DIGITALIS STUDIES ON CHILDREN WITH HEART DISEASE

II. THE EFFECTS OF DIGITALIS ON THE SINUS RATE OF CHILDREN WITH RHEUMATIC FEVER AND CHRONIC VALVULAR HEART DISEASE *

SIDNEY P. SCHWARTZ, M.D.
AND
JOHN B. SCHWEDEL, M.D.
NEW YORK

The purpose of this study was to determine the effects of digitalis on the sinus rate of children with rheumatic heart disease and signs of heart failure and to point out the relationship between the slowing of the sinus rate when present and the relief from symptoms. Attempts were made to determine whether the amounts of digitalis required to slow the sinus rate could be used as an index of its therapeutic dose for children with heart disease. Although a reduction of the sinus rate is no longer regarded as a therapeutic index for digitalis therapy in adults,[1] for children the drug is still used with this purpose in view.[2] Indeed, in recent years, such reduction in the sinus rate when accompanied by nausea and vomiting has been considered the criterion for determining the therapeutic dose of the drug for children with heart disease.[3]

Sutherland [2] reported a series of six cases in children under 14 years of age with organic rheumatic heart disease and signs of heart failure in whom the daily administration of "French" digitalin (the equivalent of approximately 3 cc. of the tincture of digitalis per day) was followed by a slowing of the sinus rate. These children showed a persistently accelerated cardiac rate varying between 115 and 130 beats per minute, usually following a recurrent exacerbation of rheumatic fever. The drug was not administered until their temperature had come down to normal, that is, a time when the disease was apparently inactive. Some of these children were ambulatory patients, but they were easily rendered breathless by exertion.

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* From the Medical Service of Dr. B. S. Oppenheimer, the Montefiore Hospital for Chronic Diseases, New York.

1. Robinson, G. C.: The Therapeutic Use of Digitalis, Medicine **1**:55, 1922.

2. Sutherland, G. A.: The Therapeutic Action of Digitalis on the Rapid, Regular, Rheumatic Heart, Quart. J. Med. **12**:183, 1919.

3. McCullogh, H., and Rupe, W. A.: Studies in Digitalis Dosage in Children, Am. J. M. Sc. **162**:231, 1921.

The average cardiac rate before treatment was 124, and on the fifth day after treatment was begun, it had fallen to an average of 82 beats per minute, a rate which was considered by Sutherland to show the full slowing action of the drug. The results obtained were fairly uniform. The total amount necessary to produce slowing was $\frac{1}{27}$ grain of digitalin or approximately 9 cc. of the tincture of digitalis. The slowing of the rate was invariably accompanied by nausea and vomiting. (The amounts of French digitalin necessary to produce nausea and vomiting are not stated.) Approximately one fourth of the original dose was sufficient to maintain the slowing effect without toxic manifestations.

The slowing of the sinus rate was distinctly beneficial, as evidenced by a reduction in the size of the heart, the reappearance of murmurs which had become inaudible, the diminution in the size of the liver and the subsidence of dyspnea. In one case with generalized edema and oliguria, complete relief followed the slowing of the heart rate.

Sutherland's observations have been confirmed in part by McCullogh and Rupe.[8] They have reported observations on the effects of digitalis on the heart rate of thirty-six normal children to whom they administered the drug until the appearance of nausea and vomiting, or until such alterations were observed in the electrocardiograms as have been previously recognized to be effects of digitalis. (The exact nature of these graphic effects are not reported in detail.)

They found slowing of the heart rate of 15 or more beats per minute as counted on the electrocardiograms only in nine of the thirty-six cases. On the other hand, vomiting was observed as the first sign in thirteen cases. When vomiting occurred, it seemed to be an early symptom and followed the administration of smaller quantities of the drug than were recognized to produce other effects. They observed the appearance of sinus arrhythmia as an early sign occurring before other changes in the electrocardiogram. Although McCullogh and Rupe found no qualitative differences in the action of digitalis on children as compared with adults, they did notice that children required larger quantities of the drug to produce comparable effects. They advised the use of the drug for children with heart disease to the point of nausea and vomiting or slowing of the heart when there was acceleration of the sinus rate and when such causes of acceleration as pain, fatigue, excitement and fever have been removed.

REPORT OF CASE

Three cubic centimeters of a standardized tincture of digitalis having approximately an activity of 1 cc. per cat unit was administered daily to twelve children until nausea or vomiting appeared.

All of the children were admitted to the Montefiore Hospital within the last three years, and in each instance there was a definite history of recurrences and exacerbation of rheumatic fever. They all showed definite organic valvular

involvement of the heart and symptoms and signs of progressive heart failure, such as shortness of breath, enlargement of the liver and, in several instances, swelling of the face or scrotum and pitting edema of the lower extremities.

These children were between the ages of 4 and 13. There were seven boys and five girls. All of them had sinus rhythm with a ventricular rate that varied from a minimum average of 80 beats per minute to a maximum of 140.

The children received no drug within six weeks preceding these tests. Attempts were made in each case to carry out the experiments at a time when the children were in the inactive stage of rheumatic fever, but, as will be shown later, fortuitous circumstances prevented us from doing so. Some of the children with normal temperatures for months preceding these tests developed active carditis during the period of observation.

Two sets of observations were carried out. One group of seven children was kept in bed while another group of five children was allowed to be up and about and to carry on normal activities, such as attending the hospital school and playing in the yard.

The seven children of the first group were in bed for a considerable time before and throughout the period of observation which ended forty days after the beginning of the experiments. The digitalis in tincture form was administered by one of us in daily doses at 9 a. m. of each day, the same preparation being used for all the children.

The digitalis was discontinued when vomiting occurred more than once and when this could be definitely attributed to the use of the drug. Daily pulse rates were taken every four hours and as often as every half hour when any unusual features of rate and rhythm were noted. The average of two counts was taken as the night count, one some time early in the evening and the other about midnight. In order not to disturb these children at night, the apical impulse of the heart or the carotid pulsations in the neck were used as guides for counting the rate. These counts were checked up from time to time and detailed notes made of any changes in rhythm or variations in signs or symptoms.

Electrocardiograms were taken daily at approximately the same time and more often, when it was thought necessary, for several days preceding, during and subsequent to the period of observation.[4]

In the first group of children, these experiments were repeated several months apart in order to determine whether or not there were any variations in the response to the drug at a different time when signs of decompensation were not as prominent as during the first period of observation.

In the second group of five children, attempts were made to study the effects of digitalis on the heart rate during activity, simulating as closely as possible the group of ambulatory children reported by Sutherland, who showed a marked improvement after the daily administration of approximately 3 cc. of the tincture of digitalis.

Before reviewing the results obtained from our experiments, it is worth while to consider the daily variations in the heart rate occurring in children under the influence of emotion or exertion both at rest and during activity, as well as during an active bout of rheumatic fever.

4. The successive irregularities produced by digitalis on the diseased hearts of children during the daily administration of 3 cc. of the drug until the appearance of nausea and vomiting have been studied from approximately 1,500 electrocardiograms taken during three separate sets of observations on twelve children.

VARIATIONS OF PULSE RATE IN CHILDREN WITH VALVULAR HEART DISEASE DURING RHEUMATIC FEVER AND DURING THE FREE INTERVAL

The spontaneous fluctuations in the heart rate of adults both during health and during disease have long been appreciated. A keener insight into some of the factors responsible for these tidal variations may be gained from the recent researches of Boas with his cardiotachometer.[5] In children, however, it is only lately that attempts have been made to correlate the variations in heart rate with any significant pathologic conditions. For example, it is well known that there may be a normal variation of as many as 30 beats per minute between the sleeping and waking heart rates of children with normal hearts. Sutherland and McMichael [6] claimed that in childhood such variations are due primarily to the fact that children have a more unstable nervous mechanism. Boas' results, however, indicate that in some adults the nocturnal and diurnal variations, as well as the difference in rate from day to day, may be even greater than those in children as reported in the foregoing paragraphs.

An interesting observation made by Sutherland and McMichael is the disappearance of marked diurnal variations in the heart rate of children with rheumatic fever and valvular heart disease at the time of an active bout. As a matter of fact, they considered this lack of variation in the day rate an ominous prognostic sign which, with the presence of a persistently rapid rate, is taken as an index of activity with actual rheumatic involvement of the sinus node of the heart.

Furthermore, it is reported by these authors that during rheumatic fever, the night rate does not slow down as it does during the inactive state of the disease.

All of these factors must be taken into consideration if we are properly to evaluate the effects of digitalis on the sinus rate. For this reason, in order to insure accuracy, we have taken, as has been stated, several counts during both the day and the night and more frequently as it was thought necessary, thus obtaining an average which, when plotted for both the day and the night rates, is considered sufficiently accurate for comparisons with the heart rates obtained following the administration of digitalis.

It should be stated here that we have confirmed the observations of Sutherland and McMichael, with the exception of the fact that even during persistently high fever we have noted a definite lowering of the

5. Boas, E. P., and Weiss, M. M.: The Heart Rate During Sleep as Determined by the Cardiotachometer: Its Clinical Significance, J. A. M. A. **92**:2162 (June 29) 1929.

6. Sutherland, G. A., and McMichael, J.: The Pulse Rate and Range in Health and Disease During Childhood, Quart. J. Med. **22**:519, 1929.

heart rate during the night, which at times was as great as that observed during the inactive stage of rheumatic fever.

THE EFFECT OF DIGITALIS ON THE SINUS RATE OF CHILDREN DURING REST

A progressive slowing of the sinus rate was noted in the seven children who were kept in bed, after they had received from 3 to 9 cc. of the tincture administered orally in doses of 3 cc. daily. The average slowing effect was fairly uniform in type, as may be seen from some of the accompanying curves. A clearer concept of the maximum slowing induced by the drug on the sinus rate of these children may be gained from the figures in table 1 which have been obtained from the pulse counts controlled by repeated electrocardiograms.

TABLE 1.—*The Maximum Variations in the Sinus Rates of Seven Bedridden Children Before and After the Administration of Digitalis in Daily Doses of 3 Cc.*

Name	Sex	Age, Years	Weight, Pounds	Average Day Heart Rate Before Digitalis	Average Day Heart Rate Following Full Digitalis Effect	Reduction in Day Rate Due to Digitalis	Average Night Heart Rate Before Digitalis	Average Night Heart Rate After Full Digitalis Effect	Reduction in Night Rate Due to Digitalis
P. S.	F	4	37	98	72	21	80	63	17
R. R.	F	4	34	108	71	37	92	60	32
J. M.	M	7	37	80	60	20	70	54	16
W. A.	M	9	69	108	75	33	92	64	28
M. DeP	F	10	60	102	80	22	90	70	20
H. F.	F	10	54	102	68	34	82	56	26
M. K.	M	13	76	98	64	34	88	63	25
Total Average				98.7	70.0	28.7	84.0	61.4	23.4

The average day heart rate for this group, prior to the administration of the drug, was 98.7 beats per minute, the lowest being 80 and the highest 108. The diurnal variations in these children were as high as 42 beats per minute. The nocturnal variations were not studied in such detail.

The average day rate was followed in each case for several days before the experiment began and was found to be quite constant, the variations of the average rate from day to day for five days being no more than 10 beats per minute.

The average night heart rate was 84 beats per minute, the lowest being 70 and the highest 92 beats per minute. Thus, the average difference between the day and the night rate was 14.7 beats per minute, the lowest being 10 and the highest 20 beats.

The average day heart rate following the full digitalis effect was 70 beats per minute, while the night rate averaged 61.4 beats. In other words, whereas the spontaneous variations between the day and the

night heart rates before digitalis averaged only 14.7 beats per minute, following digitalization the difference was 37.3 beats.

The average reduction in the day heart rate was 28.7 beats, while the average reduction in the night rate was 23.4 beats.

The diurnal variations of the heart rates observed prior to the use of digitalis were not materially changed after the drug had its effects. Moreover, a noticeable variation in the average heart rate was seen in several children from day to day before maximum slowing took place. For example, in one child the average rate slowed down 20 beats per minute on the second day after the administration of 6 cc. of digitalis, then went up from 10 to 15 beats on the third day after 9 cc. and slowed down again on the fourth day after 12 cc. further than on the first day, and thus it continued from day to day until maximum slowing was obtained.

In two children, these changes were observed over a period of fifteen days, during which time 45 cc. of the tincture had been given.

The reduction of the night rate following digitalization was almost parallel to that of the day rate, but unfortunately it was not possible to make such detailed studies of the nocturnal variations.

While the slowing of the rate was taking place from day to day as more digitalis was administered, the diurnal variations became more irregular. This was very noticeable when counts were made every half hour. On about the fourth day, four of the children began to show phasic variations in the rhythm of the heart. The electrocardiograms revealed the presence of a marked sinus arrhythmia.

In three children this irregularity was associated with shifting of the pacemaker, giving rise to variations in the size, shape and contour of the P waves in all three leads, but most marked in lead 3. In several children, the more pronounced sinus arrhythmia, with long phases of slowing and acceleration, persisted until the end of the observations.

Sino-auricular block was observed in three children on about the seventh day after approximately 21 cc. of digitalis had been taken. Because of the presence of sinus arrhythmia, it was difficult to appreciate this clinically. This change in rhythm may be recognized from the electrocardiograms, however, by the occasional omission of a complete heart cycle, the next one following after an interval almost exactly double the normal interval. At such times, the heart rate was found to be as low as 52.[7]

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7. In calculating the averages for the reduction in the sinus rate following digitalization, no counts were taken when any of these so-called minor toxic manifestations such as sino-auricular block, dropped beats or ventricular escapes were present.

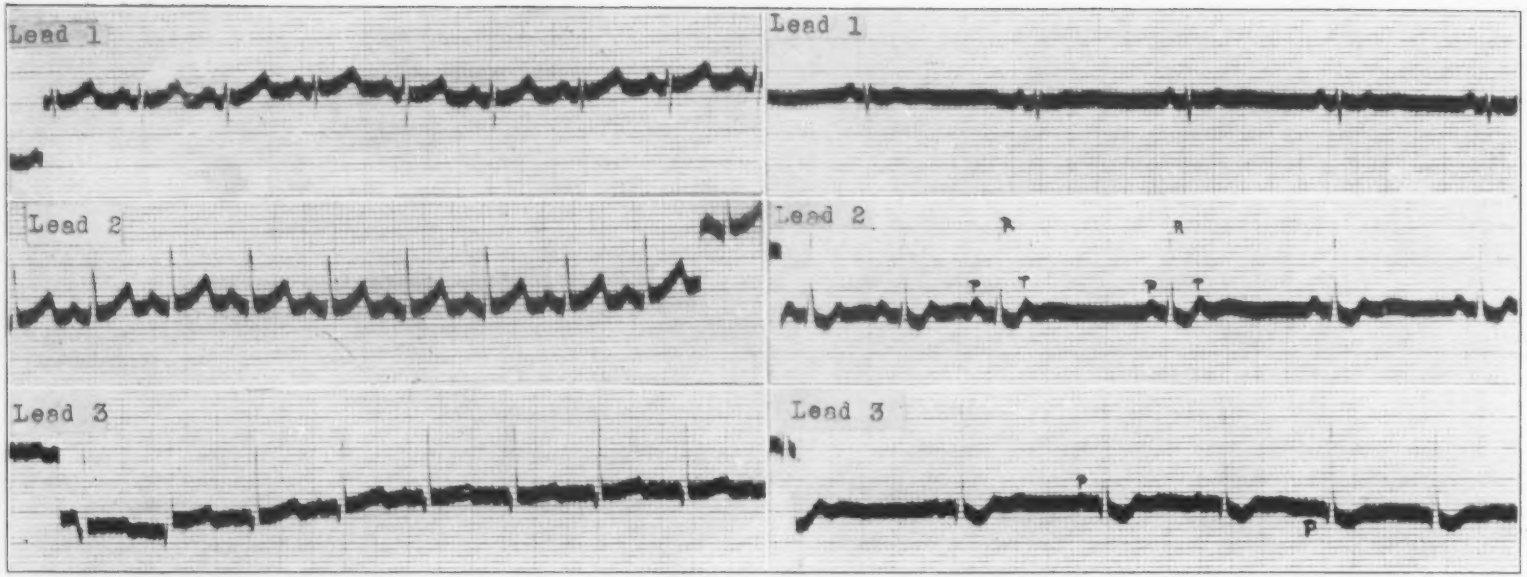

Fig. 1.—Comparison records before and four days after the daily administration of 3 cc. of digitalis in a child aged 4 years with rheumatic heart disease and congestive heart failure; marked sinus arrhythmia, irregular acceleration and retardation of the sinus rate. The T waves are reduced in size in leads 1 and 2 and markedly negative in lead 3. Note in lead 3 the variations in shape, size and form of the P waves from beat to beat indicating shifting of the pacemaker.

In all of the children in whom sino-auricular block appeared, variations were noted in the duration of the P-R interval. Deep breathing was found to increase the frequency of the sino-auricular block while in two children in whom it was most marked, the subcutaneous administration of atropine sulphate, $\frac{1}{50}$ grain, abolished the irregularity and restored sinus rhythm at an average of 98 beats per minute. The maximum changes induced by atropine were not observed until forty-five minutes after its use. As its accelerating effects wore off within two hours, the block reappeared and remained on and off for approximately twenty-two hours.

Electrocardiograms taken between the seventh day and the twelfth day after the use of from 21 to 36 cc. of digitalis give a clue as to why further slowing is frequently observed after the maximum sinus slowing due to the drug had already taken place. It is due to ventricular escape, which was observed in three children.

This, at first, takes place only occasionally so that the electrocardiograms reveal single examples of this phenomenon, but in one child repeated escapes were observed throughout the entire day. A possible explanation of this is that at such times when the depression of conduction is marked and the auricular stimulus fails, the lowest part of the A-V node sets up an impulse of its own, and the idioventricular pacemaker, which is situated in this region of the node, is responsible for initiating the next ventricular contraction. No P waves or signs of auricular activity are noted preceding the escaped ventricular beat. The P waves, however, are seen frequently to follow the R wave. The P-R interval following a ventricular escape is often found to be longer than the normal conduction interval.

The ventricular escapes in these children appeared suddenly and without any previous graphic evidence of a conduction disturbance, nor was there nausea and vomiting.

In two children, a progressive increase of the P-R interval from day to day was followed eventually by the appearance of dropped beats. In one child, the dropped beats appeared at a time when the P-R interval measured only 0.28 second. During their presence, the heart rate was practically halved for several minutes at a time. In another child, dropped beats were ushered in by progressive increases in the P-R interval from beat to beat, the so-called Luciani or Wenckebach periods, finally resulting in failure of ventricular response to a preceding auricular beat. One child was keenly conscious of some sensation accompanying the omission of such a ventricular contraction. Successions of alternate dropped beats were observed in one child for as long as twelve hours.

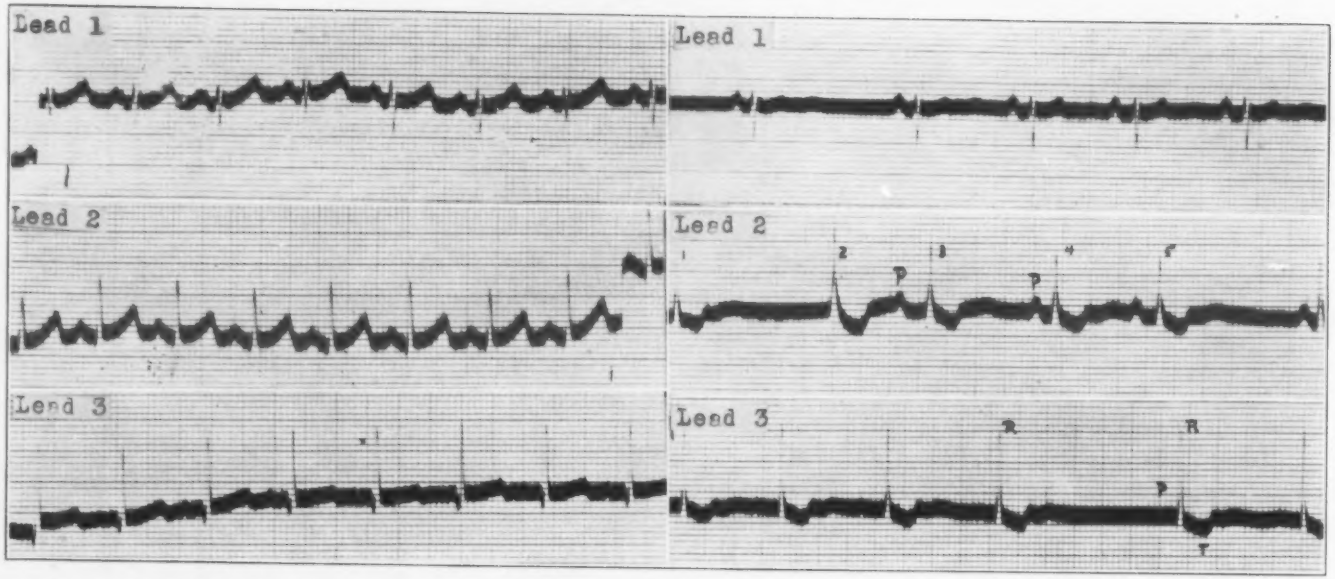

Fig. 2.—Comparison records before and after the daily administration of 3 cc. of digitalis for seven days in a child aged 4 years. Lead 1 shows marked sinus arrhythmia; in lead 2, note the absence of the P wave preceding the second ventricular complex with ventricular escape. The P-R interval following this ventricular complex is 0.2 sec. wide as compared with the normal P-R interval which is only 0.12 sec. The fifth ventricular complex in lead 2 is followed by a pause due to marked sinus arrhythmia. Note also the shifting of the pacemaker in this lead.

It was possible to abolish temporarily all of these arrhythmias by exercise or the subcutaneous administration of 1/50 grain of atropine sulphate. For this reason, it is fair to assume that all of these irregularities were due to stimulation of the cardio-inhibitory mechanism by digitalis.

In one child, the sequence of events following digitalization was most unusual and deserves special consideration, since successive electrocardiograms of this type have never before been associated with digitalis administration in human beings.

The average resting heart rate of this child was 125 beats per minute. The electrocardiograms at this time revealed right ventricular predominance with a negative T 3 in lead 3.[8]

The P-R interval measured 0.16 second, and the P wave was notched. Following the administration of 3 cc. of digitalis, the rate

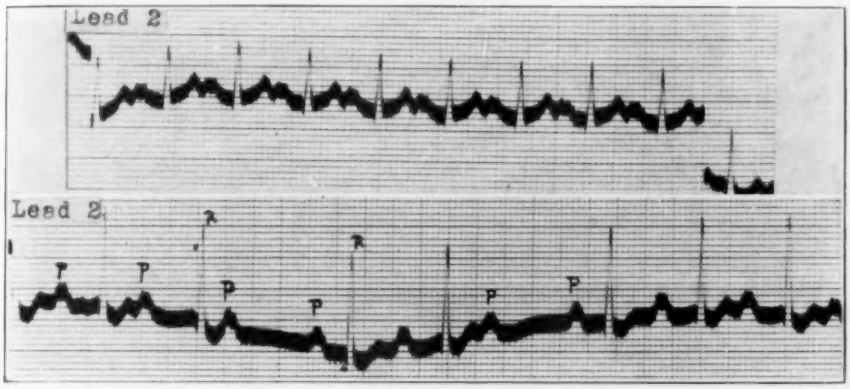

Fig. 3.—Lead 2 only. Comparison records before and twelve days after the daily administration of 3 cc. of digitalis in a child aged 10 years. Irregularity of the heart produced by variations in the P-R interval from beat to beat. Two ventricular beats are omitted, giving rise to dropped beat phenomenon. The first dropped beat follows a progressive increase of the P-R interval from beat to beat, the so-called Luciani periods. The second dropped ventricular beat also follows a beat with a prolonged P-R interval.

was reduced to approximately 107 beats. The A-V conduction time remained the same.

After the administration of 9 cc. of digitalis, the heart rate was lowered to 93 beats per minute and the P-R interval increased to 0.17 second. Two days later, after a total administration of 15 cc. of digitalis within five days, there was a gradual increase in the heart

8. Only lead 3 of the electrocardiogram is reported and reproduced, since it is desirable to call attention to the effects of digitalis on the S-T interval and T waves of this child.

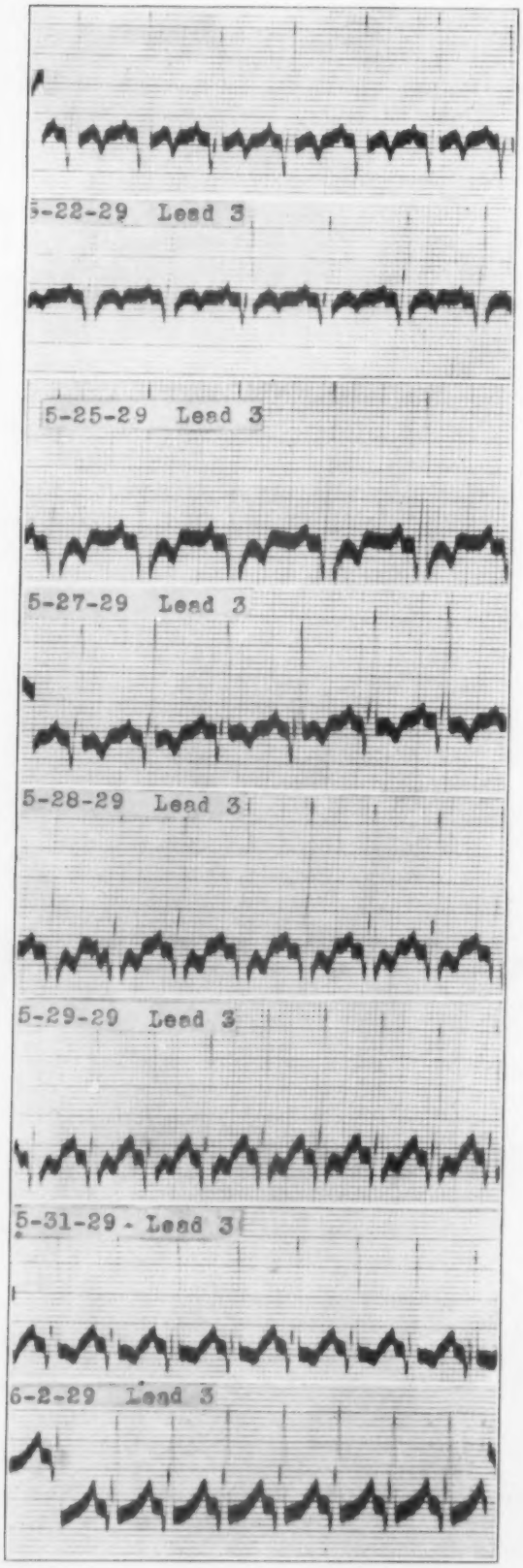

Fig. 4.—Comparison records, lead 3 only, before and after the daily administration of 3 cc. of digitalis in a child 11 years of age. At first there is a transitory slowing of the sinus rate from 125 to 93 beats, most evident after the use of 9 cc. of digitalis. Following that there is a progressive increase in the heart rate from day to day until it reaches 162 beats per minute when nausea and vomiting appeared.

rate to 125 beats instead of the usual decrease in rate noted in other children. Observations made throughout the day confirmed the persistence of this rate without the presence of any arrhythmias. The further administration of 3 cc. of digitalis produced on the following day an increase of the heart rate to 136 beats per minute. The T wave was now diminished in size, and there was a marked reduction in the T-P interval.

On May 31, 1929, after a total of 27 cc. of digitalis had been taken by the child, the average heart rate was 150 beats per minute. The electrocardiograms on this day revealed a marked diminution in the

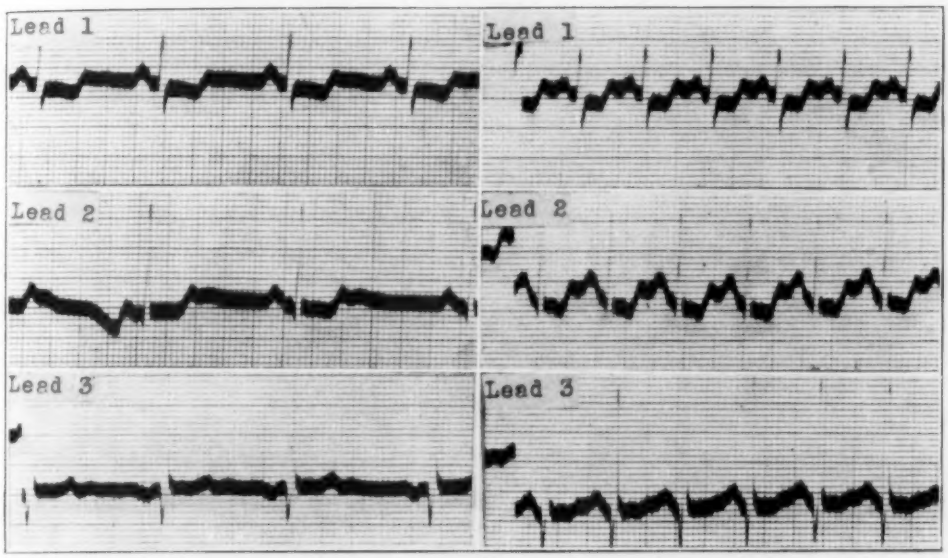

Fig. 5.—Comparison records on the digitalized heart before and after the subcutaneous use of atropine sulphate, 1/50 grain in a child aged 9 years with mitral stenosis and insufficiency and marked passive congestion of the liver. Nine cubic centimeters of digitalis reduced the heart rate from 128 to 60 beats per minute, while atropine increased it from 60 to 120 beats, abolished the sinus arrhythmia and reduced the P-R interval from 0.20 to 0.16 second.

size of the T wave, and its ascending limb had become incorporated with that of the P wave, thus reducing the T-P interval to 0.04 second.

Two days later, on June 2, 1929, after a total of 36 cc. of digitalis had been taken in twelve days, nausea and persistent vomiting were such as to make impossible, further observations. The electrocardiograms revealed a sinus tachycardia with a ventricular rate of 162 beats. The T and P waves were superimposed.

That this resulting increase in the heart rate after a transitory slowing was a digitalis manifestation may be assumed from the presence

of other evidences of digitalis effects, for example, the changes in the T waves in lead 3 from negative to positive. Such variations are considered the effects of the drug,[9] and it is fair to assume that the tachycardia and the T wave changes were the result of one and the same factor, namely, the administration of digitalis.

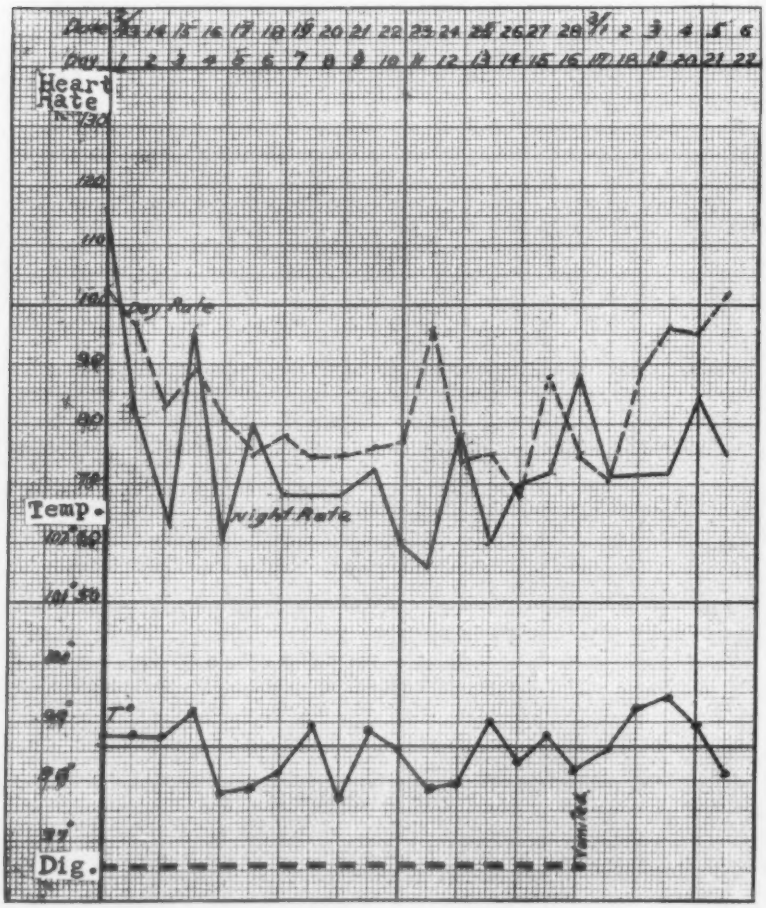

Fig. 6.—The influence of digitalis on the day and night rates of a child aged 10 years with cardiac hypertrophy, mitral stenosis and insufficiency and marked passive congestion of the liver during the inactive stages of rheumatic fever. Maximum slowing occurred after 15 cc. of digitalis while nausea and vomiting appeared after 50 cc. of the drug. Note that the slowing of the sinus rate is not maintained during digitalis administration.

9. Schwartz, S. P., and Weiss, M. M.: Digitalis Studies on Children with Heart Disease: The Effects of Digitalis on the Electrocardiogram of Children with Rheumatic Fever and Chronic Valvular Heart Disease, Am. J. Dis. Child. **38**:699 (Oct.) 1929.

THE EFFECTS OF DIGITALIS ON AMBULATORY CHILDREN

In five ambulatory children, observations were made on the sinus rate following the daily administration of 3 cc. of digitalis until the production of nausea and vomiting. The average heart rate was 120 beats per minute when they were up and about. The average spon-

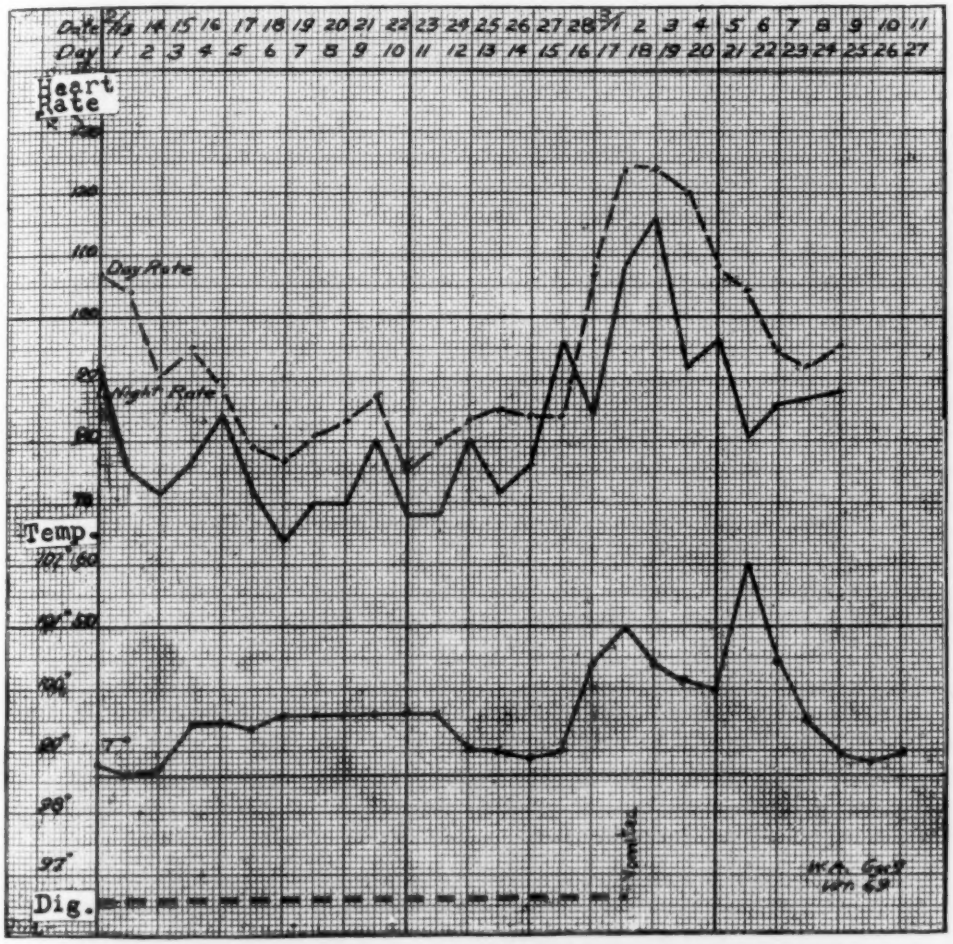

Fig. 7.—The influence of fever on the digitalized heart following sinus slowing produced by the daily administration of 3 cc. of digitalis. Although this child had received 51 cc. of digitalis until nausea and vomiting appeared, fever immediately increased the rate to above normal. Note that the rate curves are about parallel to the fever curves.

taneous reduction at night was 42 beats per minute. The diurnal variations were less marked than in those who were kept in bed. A very slight but noticeable reduction of the sinus rate of about from 10 to 14

beats per minute was observed practically in all within three days after the use of the drug. The slowing became very evident when the children were allowed to rest in bed for a few minutes before the counts were taken.

The night rates following digitalization were reduced practically to the same extent as the night rates of the children who were kept in bed. In four children, it was during marked rest at night that it was possible to observe the cardiac irregularities similar to those seen in the children who were kept in bed.

It was noted that the amount of digitalis necessary to induce vomiting was less in these children than in those who were bedridden.

THE EFFECTS OF FEVER ON THE DIGITALIZED HEART

During the course of these studies after the beginning of the observations, there developed in two children signs of active carditis with

TABLE 2.—*The Relationship Between Age, Sex, Body Weight and Amount of Digitalis Necessary to Produce Nausea and Persistent Vomiting in Seven Bedridden Children*

Name	Sex	Age, Years	Weight	Amount of Digitalis Necessary to Produce Vomiting	Amount of Digitalis Required to Produce Vomiting at Subsequent Observations
P. S.	F	4	37	20 cc.	
R. R.	F	4	34	47 cc.	
J. M.	M	7	37	25 cc.	24 cc.
W. A.	M	9	69	50 cc.	25 cc.
M. DeP.	F	10	60	50 cc.	
H. F.	F	10	54	50 cc.	27 cc.
M. K.	M	13	76	47 cc.	

fever, pallor, progressive anemia and leukocytosis. One child had already received 24 cc. of digitalis in eight days, and the other had taken 51 cc. in seventeen days. In one instance, nausea and persistent vomiting appeared with the onset of the fever. In the other, vomiting came on several days after the fever had set in.

Although in both instances a progressive daily reduction in the heart rate had been obtained following digitalization, with the onset of fever the rate increased very rapidly, so that within three days it averaged 50 beats per minute more than the normal rate. Attempts to reduce the rate in these children during active carditis after digitalization were futile, since even from four to six days after the last dose of digitalis had been given, only a small quantity was necessary to induce persistent vomiting. That these children had been well digitalized could be appreciated from the various changes in the electrocardiograms usually associated with digitalis action on the heart.[9] As the fever subsided there was a uniform, progressive reduction of the day and night rates paralleling closely the temperature curve.

DIGITALIS AND THE APPEARANCE OF NAUSEA AND VOMITING

A review of the amounts of digitalis necessary to produce nausea and vomiting in both the children who were kept in bed and those who were ambulatory clearly demonstrates that there is no fixed relationship between slowing of the sinus rate and the production of emesis. Sinus bradycardia through vagal inhibition is an early digitalis manifestation which appeared in all children during rest. It was a transitory phenomenon, depending on a certain "concentration" of digitalis in the body.

For example, while maximum slowing of the sinus rate without any irregularities occurred on an average after the administration of from 3 to 9 cc. of digitalis, nausea and vomiting did not appear until from 24 to 50 cc. of the drug had been administered.

A further reduction in the sinus rate through excessive vagal inhibition by digitalis resulted in the development of such irregularities as sino-auricular block, dropped beats and ventricular escape long before the appearance of nausea and vomiting. Since none of these so-called minor toxic manifestations could be considered to be of benefit to the children in whom they were observed, it should be obvious that nausea and vomiting, a much later manifestation in the course of digitalis therapy, cannot be used as a criterion of the therapeutic dose of the drug in children with heart disease.

Furthermore, it is interesting to note that variable quantities of digitalis were necessary to produce nausea and vomiting in the same children when the experiments were repeated several months apart.

THE EFFECT OF THE SLOWING OF THE SINUS RATE ON SYMPTOMS

The clinical condition of these children, such as shortness of breath, swelling of the face or scrotum and enlargement of the liver or pitting edema of the lower extremities, was not materially changed during the presence of sinus slowing, as a result of digitalis administration. During rest, especially complete rest as observed in deep sleep, the respirations were practically the same in all children before and after the use of digitalis, provided the children did not show signs of active rheumatic fever. Digitalis was unable to check the rapid beating of the heart produced by active fever, even in quantities large enough to induce nausea and vomiting. Furthermore, careful measurement of the size of the liver from day to day yielded no appreciable changes after the process of digitalization. As far as diuresis is concerned, an increase in weight, probably due to water retention, was registered in several of the children when the experiments were finished.

SUMMARY

Tincture of digitalis was administered in daily doses of 3 cc. to twelve children with chronic rheumatic valvular heart disease and signs of heart failure, until the appearance of nausea and vomiting.

A progressive slowing of the sinus rate was noted in all seven children who were kept in bed after they had received from 3 to 9 cc. of the drug during the inactive phase of the disease. The maximum reduction in the day heart rate on an average was 28.7 beats per minute. The reduction in the night rate following digitalization was almost parallel to that of the day rate.

Four children showed marked phasic variations of the rate at about the fourth day of the experiment. A shifting of the pacemaker, giving rise to variations in the P wave, was seen in three children at about the seventh day of digitalization after approximately 21 cc. of the drug had been taken. Ventricular escape was recorded in three children between the seventh and the twelfth day. In two children, dropped beats appeared at the same time.

Similar irregularities were recorded at night in four of five children who were ambulatory during the day. In these children, there was no reduction of the sinus rate during the day while they were up and about. Slowing of the sinus rate was noticeable in them, however, as soon as they were allowed to rest for a few minutes.

It was possible to abolish all of these cardiac irregularities and temporarily restore normal sinus rhythm by the subcutaneous injection of atropine sulphate, 0.001 Gm.

In one child whose average heart rate was 125 beats per minute, the rate was reduced to 93 beats after a total of 9 cc. of digitalis had been given. Following that, the further daily administration of the drug in doses of 3 cc. resulted in a progressive increase of the heart rate to 162 beats after a total of 36 cc. had been taken. At this time the electrocardiograms revealed sinus tachycardia, and nausea and vomiting appeared. This was considered an unusual toxic digitalis manifestation resulting from the direct action of digitalis on the sinus node.

In two children in whom digitalis had slowed the heart rate, active carditis abolished the bradycardia and increased the heart rate to above the normal level.

No improvement in symptoms or general condition was observed in these children during the period of observation.

Nausea and vomiting developed in all children as a very late manifestation of digitalis action after the use of from 24 to 50 cc. of the drug, whereas slowing of the sinus rate was a very early effect which appeared progressively from the first day. Furthermore, sinus bradycardia, the only type of slowing of the heart rate which could be con-

sidered of therapeutic value, was a transitory phenomenon in all children, never lasting more than from four to seven days at the most. A further reduction in the heart rate was due to block, and certainly cannot be thought of value.

Since there is no quantitative relationship between sinus bradycardia and the appearance of nausea and vomiting, the latter cannot be used as a criterion in estimating the optimal therapeutic dose of digitalis for children with chronic rheumatic valvular heart disease and signs of heart failure.

A TUBERCULIN REACTION SURVEY AMONG HOSPITALIZED CHILDREN IN IOWA*

MARGUERITE HORNING TAYLOR, M.D.
IOWA CITY

Since the publication of Hamburger and Monti's [1] report in 1909, there has been considerable interest and study in the estimation of the incidence of tuberculous infection in children in various parts of the world. Until recent years, most of the data available have been compiled from urban clinics. In a careful search through the literature for data representative of rural districts, there were found studies by Slater [2] in Minnesota, Baker [3] in Alberta, Ferguson [4] in Saskatchewan and Vories [5] at the Mayo Clinic. There being considerable variation in the results reported it seemed that it would be of interest to compare the data herewith presented with these studies as well as with some from urban centers.

The data has been collected from the records of patients treated in the pediatric division of Children's Hospital, Iowa City. The children are preponderantly of the indigent class. Although they are not strictly rural, essentially they represent a rural class, most of them coming from small towns when not coming directly from farms.

For some years the tuberculin test has been used routinely, the exceptions being sufficiently infrequent to leave the tested cases an unselected group. The results are shown in table 1.

The cutaneous and intracutaneous tests are tabulated separately. Clinically recognized tuberculosis has been excluded. For the most part the cutaneous tests (Pirquet) represent the earlier part of the period surveyed and the intracutaneous tests the latter part. The intracutaneous tests in practically all cases consisted of an intradermal injection of 0.1 mg. of old tuberculin. During the early period a con-

* Submitted for publication, Sept. 25, 1929.

* From the Department of Pediatrics, College of Medicine, State University of Iowa.

1. Hamburger, F., and Monti, R.: Die Tuberculosehaufigkeit in Kindersalter, München. med. Wchnschr. **46**:449 (March 2) 1909.

2. Slater, S. A.: The Results of Pirquet Tuberculin Tests on 1654 Children in a Rural Community in Minnesota, Am. Rev. Tuberc. **10**:299 (Nov.) 1924.

3. Baker, A. H.: The Tuberculosis Survey of School Children in Alberta, 1924, Canad. M. A. J. **15**:816 (Aug.) 1925.

4. Ferguson, R. G.: A Tuberculosis Survey of 1346 School Children in Saskatchewan, Canad. M. A. J. **12**:381 (June) 1922.

5. Vories, R. E.: Incidence of Tuberculous Infection in Children from Rural Districts, Am. J. Pub. Health **18**:1006 (Aug.) 1928.

siderable number of well babies was transferred from the maternity to the pediatric service as a preliminary to adoption, and all the children over 12 years of age were excluded. During the latter period babies were admitted to the service only when some complaint was made concering their health, and the age limit for children was raised to include 15 years.

It will be seen that the total percentage of positive reactions found in 1,356 cases by the intracutaneous method is 16.59 per cent. The incidence increases irregularly by yearly stages until it reaches a maximum of 31.4 per cent at 16 years. It may be concluded that at the age of 16 years approximately one third of the hospitalized children, excluding those with recognized tuberculosis, have become infected.

TABLE 1.—*Results of Tuberculin Tests on Patients in the Children's Hospital, Iowa City, Clinical Tuberculosis Excluded*

Ages	Cutaneous Test			Intracutaneous Test		
	Number Tested	Number Positive	Per Cent Positive	Number Tested	Number Positive	Per Cent Positive
Under 6 months	170	1	0.58	202	7	3.4
6 months to 1 year	28	2	7.1	81	7	8.6
1 to 2 years	24	1	4.1	126	22	17.4
2 to 3 years	23	0	0.0	105	17	16.1
3 to 4 years	28	2	7.1	81	12	14.8
4 to 5 years	11	0	0.0	60	11	18.3
5 to 6 years	23	3	13.04	60	11	18.3
6 to 7 years	13	2	15.4	74	15	20.2
7 to 8 years	12	0	0.0	79	9	11.4
8 to 9 years	19	0	0.0	83	16	19.2
9 to 10 years	15	0	0.0	66	17	25.7
10 to 11 years	16	1	6.2	78	21	26.9
11 to 12 years	11	1	9.09	89	17	19.1
12 to 13 years	19	3	15.8	86	16	18.6
13 to 16 years	..	..	....	80	27	31.4
Total	412	16	3.88	1,350	225	16.59

The total percentage obtained by the cutaneous test is only 3.88. This percentage represents an earlier period of the survey and a much smaller series of cases, namely 412 cases. The incidence increases irregularly by yearly stages until it reaches its maximum of 15.8 per cent at 12 years, the highest age group tested. The incidence by ages is exceeded in every case by the intracutaneous method. This may be due partly to the smaller number tested in the earlier series. However, the total per cent of incidence is disproportionately smaller than that obtained by the intracutaneous method. It appears, therefore, that the intracutaneous test is more reliable as a diagnostic measure.

To investigate this impression further, a study was made of a group of children who had been tested by both methods with no significant variation of time elapsing between the two tests. In a group of forty-two patients reacting positively to the intracutaneous test only, five patients had positive cutaneous reactions, a percentage of 11.9. Of

seventy-seven patients reacting negatively to the intracutaneous method there were two who reacted positively to the cutaneous test. A positive cutaneous reaction in the presence of a negative intracutaneous reaction has not been found by other observers. It is probable that a repetition of the intracutaneous injections in this group would have produced positive reactions. A comparison of the two methods in a series of clinical tuberculosis was carried on further. Of thirty-seven patients who were given the cutaneous test, 28 of them, or 75.6 per cent, reacted positively; of thirty patients given the intracutaneous test, twenty-three patients, or 76.6 per cent, reacted positively. Thus there

TABLE 2.—*Positive Tuberculin Reactions in Percentages Found by Different Investigators* *

Ages	St. Louis, Veeder and Johnston[6]	Minneapolis, Harrington and Meyers[7]	Rural Minnesota, Slater[8]	Mayo Clinic, Vories[5]	Alberta, Baker[3]	Saskatchewan, Ferguson[4]
	Cutaneous Method	Intracutaneous Method	Cutaneous Method	Cutaneous Method	Intracutaneous Method	Cutaneous Method
5 months to 1 year...	1.5	.....	..	8.8	....	....
1 to 2 years.....	5.5	.....	..	....	....	....
2 to 3 years.....	19.0	.....	..	....	....	....
3 to 4 years.....	....	.....	..	11.5	....	....
4 to 5 years.....	23.0	.....	..	....	....	....
5 to 6 years.....	....	.....	12	....	....	....
6 to 7 years.....	29.0	20.8	10	....	6.3	44.4
7 to 8 years.....	....	27.32	6	16.7	....	....
8 to 9 years.....	30.0	38.96	10	....	....	....
9 to 10 years.....	....	41.13	11	....	....	....
10 to 11 years.....	34.0	50.68	11	....	....	....
11 to 12 years.....	....	54.01	9	....	....	....
12 to 13 years.....	38.0	59.75	12	21.0	....	....
13 to 14 years.....	....	58.44	2	....	21.4	....
14 to 15 years.....	....	69.56	13	....	....	60.9
15 to 16 years.....	....	50.68	7	....	22.8	....
16 years and over.....	....	.....	9	....	....	....
Total per cent.....	29.97	47.48	10	16.9	13.7	56.8

* All of these statistics represent groups of school children except those of St. Louis and the Mayo Clinic which represent a hospital and dispensary clientele.

seem to be slight differences in the adequacy of the methods in cases of known active tuberculosis.

Certain factors influence the accuracy of the reports. The tests were made by different physicians, therefore, personal variations in technic and interpretation of results must be allowed. Besides this, in view of the importance being attached to repeated tests, it should be known that, with a few exceptions, the results reported were made following one test only.

For comparison with data representative of other rural districts, table 2 is given. It is interesting to observe that the result in the intracutaneous series exceeds considerably that of Slater and is approximately the same as that of Vories. Slater's low figure may be explained by the fact that it represents presumably healthy children from a wealthy

farming section in which conditions are good. Another factor that must have some influence is that the cutaneous method was used. Vories' figure, obtained mostly by the cutaneous method in 1,000 children examined at the Mayo Clinic, represents rural districts in many different sections of this country and all varieties of home conditions.

That there may be considerable variation in statistics of apparently similar groups is seen in reports by Baker and Ferguson. Baker found 13.7 per cent reactors by the intracutaneous test in 1,051 school children representing eight disticts of Alberta. Ferguson's figures surpass some of those that were reported from urban clinics. He obtained by the cutaneous method 56.6 per cent positive reactions in 1,346 school children from eight representative areas of Saskatchewan. Only a few of the children in each of the surveys were actively tuberculous or were thought to have tuberculosis. The difference in the two reports cannot be explained by the home surroundings or physical conditions of the patients tested. Although the percentage of positive reactions ran high among the Indians in the groups, Ferguson's material includes only 4 per cent more Indians than the percentage Baker includes.

For comparison with studies done in urban districts, tables by Veeder and Johnston [6] in St. Louis and Harrington and Meyers [7] in Minneapolis, are presented here (table 2). These two cities were chosen because they represent the urban population of the same geographic section as the rural population in my own state. The total incidence in each report exceeds my figure as well as those of other rural districts excepting those of Ferguson's. This is partly due, no doubt, to the influence of congested population. However, on comparing the two cities, the incidence appears to be twice as great among 2,118 representative school children of Minneapolis as found among 1,125 sick of the poorer classes of St. Louis. Here again a part of the disproportion may be accounted for by the fact that the cutaneous method was used in St. Louis, while in Minneapolis the intracutaneous method was used.

CONCLUSIONS

1. A study of a group of hospitalized children in Iowa, excluding cases of clinically recognizable tuberculosis, shows that 16.59 per cent have become infected with the tubercle bacillus as indicated by the intracutaneous tuberculin test. The proportion increases from 3 per cent under 6 months of age to 31 per cent at 16 years of age.

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6. Veeder, B. S., and Johnston, M. R.: The Frequency of Infection with the Tubercle Bacillus in Childhood, Am. J. Dis. Child. **9**:478 (June) 1915.

7. Harrington, F. E., and Meyers, J. A.: Tuberculous Infection Among Minneapolis School Children as Revealed by the Intracutaneous Test, Am. Rev. Tuberc. **14**:454 (Oct.) 1926.

2. The total incidence of tuberculous infection in children of rural districts is, in general, lower than that of congested districts. A few exceptions occur in which other factors probably counterbalance the influence of decreased density of population.

3. In cases that are not clinically tuberculous the intracutaneous test seems more reliable than the cutaneous test as a means of indicating the presence or absence of tuberculous infection.

AN AUTOMATIC RECORDING TEMPERATURE CONTROLLER FOR PREMATURE INFANTS *

RALPH M. TYSON, M.D.
AND
EDWARD F. BURT, M.D.
PHILADELPHIA

There are three big problems in the handling of premature infants: the nourishment of the infant, the prevention of infection and the maintenance of a normal temperature. It is with this last and highly important problem that we intend to deal. In a previous article we felt that we established several important facts; these led us to undertake this problem.

Many incubators and incubator rooms have been designed, tried and discarded. Their multiplicity proves that the problem of satisfactory heat regulation of premature infants is as yet unsolved. Most hospitals have abandoned their more elaborate type of incubators, and are using simple hot beds.

Hess [1] gave an excellent résumé of the history of attempts at artificial maintenance of body temperature in infants. In a brief form it is as follows:

The first real incubator was that of Denuce,[2] 1857, which consisted of a two-walled tub into which hot water was run at intervals. In 1866, Crede [3] published an article describing a similar apparatus. The first practical closed type of incubator was designed by Tarnier [4] in 1880 and was similar to those used as chicken incubators.

The Lion [5] incubator was constructed with special provision for heating water, filtering the air, automatic temperature and humidity control, and a constant circulation of air. Many of the present-day incubators are similar to this one, differing but slightly in principle. A thermometer and hygrometer are fastened inside where they can be easily seen and read.

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* Submitted for publication, Sept. 27, 1929.

* From the Department of Obstetrics, Jefferson Medical College, Philadelphia.

1. Hess, Julius, H., in Abt, I. A.: Pediatrics, Philadelphia, W. B. Saunders Company, 1913, vol. 2, p. 482.

2. Denuce: J. de méd. de Bordeaux.

3. Crede: Arch. f. Gynäk. **24**:128, 1884.

4. Tarnier: Sie wurde 1881 in der Maternite aufgestellt, und wohl zuerst in einer Arbeit von Auvard beschrieben, Arch. de Tocologie, October, 1883.

5. Quoted from Lion: Czerny-Keller, vol. 1, p. 673.

Hess has designed an electrically heated, water-jacketed infant bed. At Jefferson Hospital, we have used a hot bed with electric bulbs placed in a compartment underneath the mattress.

The giant incubator or room incubator was first designed in 1886 by H. Colerat,[6] and consisted of a room 12 feet long and 6 feet wide (3.6 by 1.8 meters). Arnaud,[7] in 1900, introduced the first hot air room. Since that time glassed-in incubator rooms have been built, and in many cases have been abandoned.

In all of these instances, some fixed temperature, usually 80 F., was set as a standard, and attempts were made to keep the temperature at that fixed point. In most instances the temperature of the infant was not taken frequently because there was no practical means at hand of doing this.

The idea of attempting to regulate a heating apparatus directly from the premature infant's own temperature was suggested by H. D. Bazett.[8]

Previous work on premature infants in a hot bed, with the use of the resistance recorder, has made us feel that the failure of the present-day incubators to solve completely the problem of the proper regulation of the temperature of these infants is due to the following causes:

Up to the present time, a certain fixed temperature was arbitrarily set (usually 80 F.), and every attempt was made to keep the incubator at that temperature. No record was kept of the temperature of the infants. This we feel is fundamentally wrong. The amount of heat necessary to maintain the temperature of a premature infant within a normal range cannot be predetermined, and varies with the mass of the baby and with the degree of development of its heat-regulating center.

For example, a comparatively heavy premature infant with a poorly functioning heat-regulating mechanism will require more heat than a smaller premature infant with the same degree of heat-regulating ability.

We have observed premature infants who were able to maintain their temperature within a normal range for a considerable length of time. Then, because of prematurity, the heat-regulating mechanism failed to coordinate properly, and the infant's temperature dropped to

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6. Colerat, H.: Soc. d. sc. méd. de Lyon, 1896.

7. Arnaud: La saka incubatrice: contributo allo studio della fisiapatologia dei neonatri premature, Tornio, 1900.

8. Bazett, H. D.; Goldschmidet, S., and McDlone, B.: Relative Importance of Central Temperature, and Peripheral Resistance in the Control of Body Temperature, read before a joint meeting of the Philadelphia, New York and New England Pediatric Societies, October, 1928.

dangerous levels. At times this infant needed heat, and at other times it did not. Our present incubators do not take this into consideration, but supply heat whether the infant needs it or not.

We have observed that in the summer months, during the heat of the day, the temperature of a premature infant is within normal limits, but when night comes on the infant needs heat. This condition is not properly considered in the usual attempt at regulation of temperature.

In many instances, the heat regulation of the infant depends on the efficiency of the nurse. Unusual circumstances frequently prevent her from rigid observation and care in maintaining a constant temperature. This is bound to result in hyperthermia or hypothermia, as we have frequently observed. As it is necessary to open and close an incubator when changing soiled diapers, continuous control is difficult.

Grulee,[9] in 1926, wrote: "Since it is only necessary to maintain normal body heat, the temperature of the air in the incubator varies with the age and debility. No absolute rules can be laid down. The older infants, after they have recovered from their initial chilling, need very little external heat, provided the nursery temperature is constant and between 75 and 80 degrees F. The younger ones require considerably more heat. Some writers arbitrarily place a certain age or weight limit as the criterion by which they decide upon the necessity of incubator care. Obviously, such methods are to be condemned. The rule should be: Supply sufficient external heat to keep the temperature of the infant constantly normal. This can be done only by observation of the infant."

An automatic recording temperature controller[10] having a range of from 90 to 110 F. on a 10 inch (25 cm.) rectilinear chart was employed. The instrument (*A* in fig. 1) records temperature continuously, drawing a record by means of a moving pen on graph paper (*B*), which advances at the rate of 1 inch (2.5 cm.) every hour. The thermometer (*G* in fig. 2) is wound with wire, the resistance of which changes with temperature. For flexibility and intimate contact it is woven similar to cloth. The sensitivity of the thermometer is such that changes in the order of 0.02 degrees F. can readily be seen on the chart. The pliable cloth thermometer is fastened by means of collodion and a light cotton band to the wall of the chest in the region of the axilla.

The recording instrument is provided with control contacts, which may be set for any desired temperature either high or low, so that it will turn a heating pad on or off. The two contacts were adjusted to turn the pad on at 97 F. and to throw it off at 98 F. It is actually possible to set the control points to a closer control, but this was found unnecessary in the cases under observation.

9. Grulee: The New-Born: Physiology and Care, New York, D. Appleton & Company, 1926, p. 177.

10. Designed by Leeds and Northrup Company.

For this work we used a heating pad, which was placed in a container (fig. 2). The inner wall of the container was made of copper, which conducts heat readily. The outer wall of galvanized iron was lined with asbestos to prevent loss of heat upward. The two ends were sealed tight. This container protects the pad from moisture, and the infant from the danger of a short circuit in the pad.

A commercial heating pad connected to a lighting circuit gave off too much heat, so that it was necessary to add a tubular resistance (*D*) to reduce the heat to approximately one tenth of the normal value. The control contacts responded according to the temperature of the baby. The amount of heat supplied by the pad was so small that even if the pad were left on continuously the temperature of the pad could not rise sufficiently to burn the infant.

As a further protection, the recorder was provided with a high contact, which was set at 101 F. This contact rang a buzzer (*E*) if the record reached 101 F. at any time.

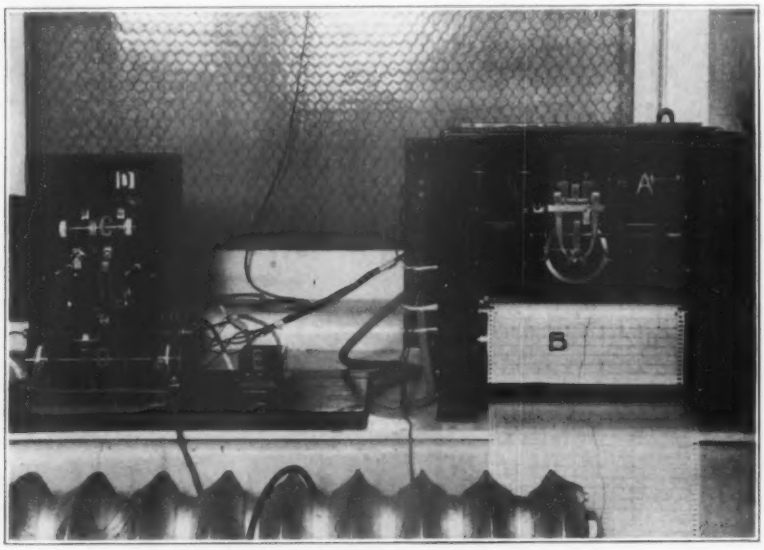

Fig. 1.—Automatic recording temperature controller. *A* indicates the continuous temperature recorder; *B*, the rectilinear chart on which the continuous axillary temperature of the infant is recorded; *C*, the automatic temperature controller; *D*, the rheostat for cutting down the heat of the pad, and *E*, the electric buzzer.

The container was placed over the infant up to the neck, so that the head was outside the heat, and the baby breathed the air of the nursery. The amount of air-space in the container was very small. This small mass of air could be heated or cooled quickly. An incubator would contain relatively a much greater mass of air, and consequently would require more heat and a longer time to bring about changes in temperature.

A comparatively large mass of air, when heated in a closed area, will require a maximum amount of heat to raise the mass of an infant to a normal temperature. When the heat is cut off, this mass of air, due to thermal inertia, will cool down relatively slowly, and the temperature of the infant will continue to rise,

until the mass of heated air has cooled to or below 98 F. Furthermore, a large volume of air, when heated without stirring, always produces stratification.

The air which the infant breathed was that of the nursery, and not a heated air. This removed the necessity of adding moisture to the air, and made the problem less complicated. Julius Hess,[11] in commenting on Moll's incubator, said: "It distinguishes itself by the fact that the head of the infant is out of the incubator, breathing the air of the room. In debilitated infants this provides a stronger respiratory stimulus, and attacks of asphyxia may be more easily avoided."

The pad was placed in a container over the infant, rather than under it. A heating pad placed under the object to be heated produces a hot spot at the place where the greatest weight rests on it, and this causes uneven heating and discomfort.

With the container, the rheostat control of the pad and the electric buzzer, we feel that we have overcome the main objections to the use

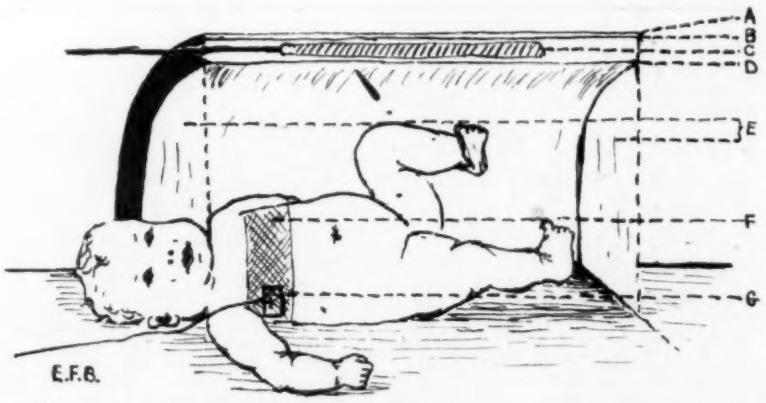

Fig. 2.—The container cut in two, to show construction and baby in position. *A* indicates the outer wall of the container, made of galvanized iron; *B*, the lining of the outer wall, made of asbestos to prevent loss of heat upward; *C*, the heating pad in position, between the outer and inner walls; *D*, the inner wall of the container, made of copper; *E*, the rubber curtains placed at each end of the container. The left curtain is fastened snugly around the baby's neck, and the right can be lifted up for the removal of soiled diapers with comparatively little loss of heat from the container; *F*, the light gauze band used to assist in holding the thermometer in position, and *G*, the flat thermometer held in position in the axilla by collodion and a gauze band.

of an electric heating pad. The same form of resistance thermometer and recording controller could probably be adapted with minor changes to any of the various incubators and hot beds.

We ran a series of continuous temperatures for normal new-born infants so that we would have a means of comparison with our incubator

11. Hess, J.: Premature and Congenitally Diseased Infants, Philadelphia, Lea & Febiger, 1922, p. 205.

infants. The French expression "monothermia" has been generally adopted, but we agree with Schelble [12] that this term is a misnomer at least as far as it applies to new-born infants. Finkelstein said that the temperature of normal infants does not vary more than 1 degree F. around an average of 98.7 F. Meyer and Rosenstein placed the variation at 0.7 degrees F. Schelble's curves showed that the variation is in the neighborhood of 1.4 degrees F. His temperature records were taken only twice a day, and he remarked that if the temperatures were taken more frequently the curves on the chart would have been even more irregular. Salge also said that there is no such thing as monothermia. Rietschel's statement that an incapacity for adjusting and regulating heat in the infant (especially an infant less than 6 months of age) is a pathologic symptom is misleading. Schelble expressed his belief that

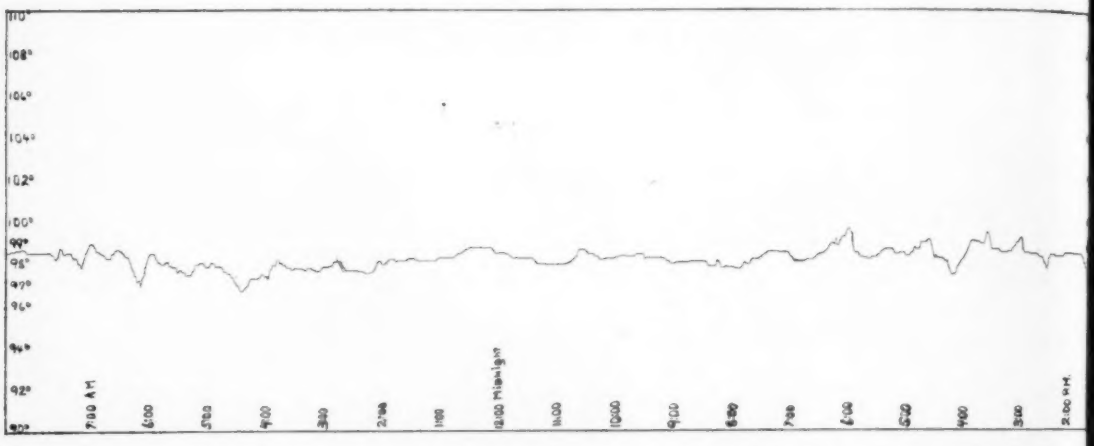

Fig. 3 (case 1).—The eighteen hour record of a full term infant. Read the record from right to left. The continuous line is the record of the infant's axillary temperature.

monothermia can be produced at will in children who are not suffering from external stimuli, such as light and noise.

Putzig and Vollmer [13] found that every increase in weight in new-born infants was accompanied by an increase in temperature, and that the daily temperature curve ran parallel to the weight curve.

In figure 3 we present a continuous temperature record of a full term infant aged 3 weeks. This record differs from that of the authors mentioned in that it is a continuous record. Monothermia does not

12. Schelble, H.: Body and Skin Temperature in Infants, Ztschr. f. Kinderh. **2**:62, 1911.

13. Putzig and Vollmer: Ztschr. f. Kinderh. **37**:259 (March 7) 1924.

exist in the average nursery, for our variation in temperature during a day was as high as 2.9 degrees F. The variations in temperature are so frequent that it is impossible to state the causative factor, and it probably does not vary with changes in weight.

Case 1 (fig. 3) was that of a full term infant, spontaneously delivered. It was on a formula consisting of whole milk, dextrose and lactic acid. The infant was not disturbed except for the withdrawal of soiled diapers during the taking of the record. It was apparently unaffected by the thermometer, and slept about fifteen of the eighteen hours shown on the record. The highest temperature, 99.6 F., was observed at 6:00 p. m., and the lowest temperature, 97.7 F., at 4:30 a. m. The infant weighed 7 pounds 1 ounce (3.2 Kg.) at birth. On the day the record was taken, the baby weighed 8 pounds 4 ounces (3.7 Kg.).

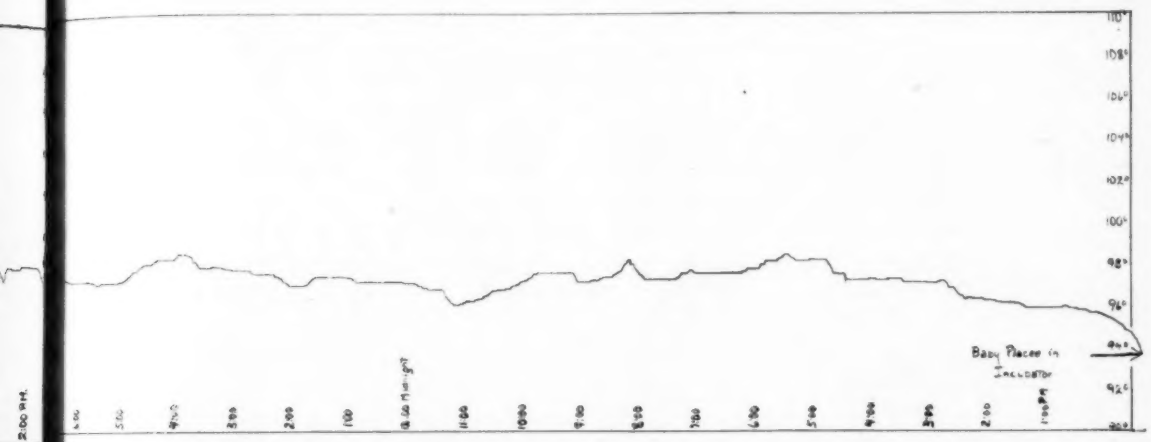

Fig. 4 (case 2).—The eighteen hour temperature record of a premature infant. The continuous line is the infant's axillary temperature. Read record from right to left.

Figure 4 is the record of a premature infant immediately following birth. During delivery, the infant had been cooled to 93.6 F. The heat container rapidly brought the infant's temperature up beyond dangerous levels. This infant was unable to maintain its temperature without assistance, owing to lack of development of the heat-regulating mechanism. This is shown by the number of times its temperature dropped to or below 97 F., when heat was automatically turned on.

Case 2 (fig. 4) was that of a premature infant weighing 3 pounds 6 ounces (1.5 Kg.). In little more than one hour the infant's temperature was brought up to 96 F. (axillary). The baby was fed partially diluted breast milk. Physical examination failed to reveal any pathologic condition.

Many premature infants have a partially developed heat-regulating center, and will need heat only occasionally. Figure 5, we feel, illustrates this point.

Case 2 (fig. 5) was that of a premature infant weighing 4 pounds 2 ounces (2.2 Kg.) at birth. This record was run about twenty-four

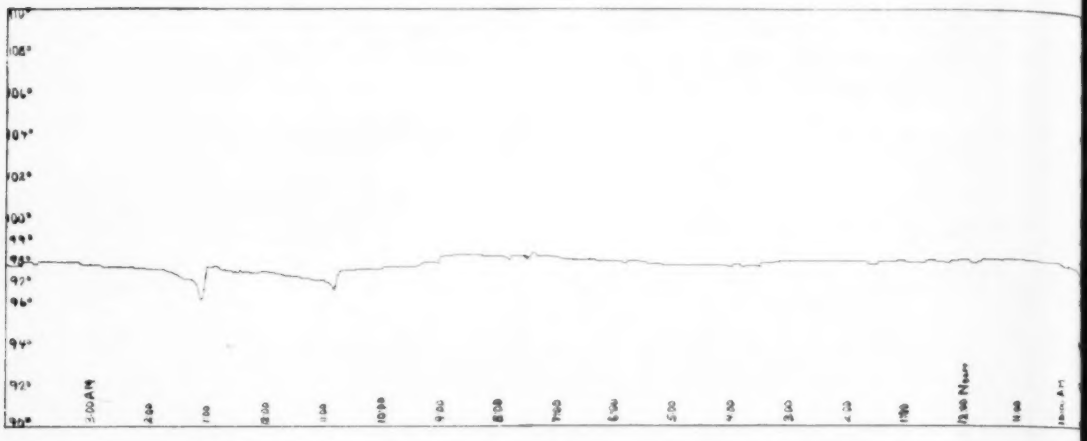

Fig. 5 (case 3).—The eighteen hour temperature record of a premature infant. The continuous line is the infant's axillary temperature. Read record from right to left.

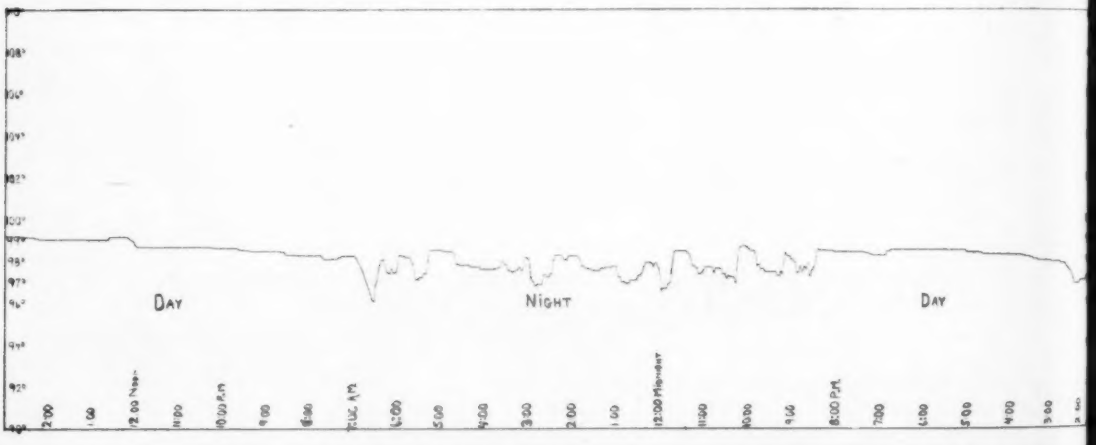

Fig. 6 (case 4).—The eighteen hour temperature record of a premature infant. The continuous line is the infant's axillary temperature. Read record from right to left.

hours after birth. The record ran for twelve hours, until 10.30 p. m., before the temperature of the infant dropped to 97 F., and heat was automatically turned on. Shortly after 1:00 p. m. there was a rapid drop in temperature, and heat was again needed.

Stransky [14] stated that two thirds of the initial deaths occur in the cold season (between October and April). On warm days the premature infant does not need extra heat, and this factor must be taken into consideration. In figure 5, this point is illustrated. During the first day the temperature was 81 F.; up until 8:30 p. m., during the heat of the day, the infant did not require any additional heat. At 8:30 p. m. the outside temperature dropped several points; as a result, that night the temperature of the infant dropped below 97 F., so that heat had to be supplied almost constantly. By 7:00 a. m. the outside temperature had risen and was soon 82 F. From this time on, the outside heat was adequate, and the infant did not need additional heat.

Case 4 (fig. 5) was that of a premature infant weighing 3 pounds 6 ounces (1.5 Kg.) at birth. This record was taken during its fifth day of life. The baby received a formula consisting of whole milk, dextrose and lactic acid.

We feel that in this automatic recording temperature controller we have met all the objections to any of the many incubators. Whether this type of incubator will cut down the mortality rate remains to be seen. Although it may appear rather complicated from our presentation, we have found it simple and practical in its performance.

SUMMARY

1. A means of automatically recording and controlling the temperature of a premature infant is here presented.

2. The control of the heat supply is based directly on the infant's axillary temperature. When the infant's temperature falls to or below 97 F., heat is automatically turned on. When it reaches 98 F., the heat is turned off.

3. The temperature curves of premature infants whose heat supply is regulated by this controller are almost similar to those of full term infants.

4. During hot weather, heat is often unnecessary. The automatic controller supplies heat only when outside conditions make it necessary.

5. Premature infants who have a heat-regulating mechanism which only occasionally fails to maintain body heat need additional heat only at these times. The automatic controller supplies heat only when it is needed.

6. The amount of heat necessary to maintain the temperature of a premature infant within a normal range cannot be predetermined. The automatic controller supplies heat until the axillary temperature has been raised to 98 F., and then it is automatically turned off.

7. Monothermia in new-born infants does not exist; variations in the temperature of the usual nursery under normal conditions may be as great as 2.9 degrees F.

14. Stransky: Wien. klin. Wchnschr. **38**:1157 (Oct. 22) 1925.

Case Reports

CHLOROMA

REPORT OF A CASE WITH RECOVERY FOLLOWING ROENTGENOTHERAPY, WITH A REVIEW OF THE LITERATURE *

ALFRED H. WASHBURN, M.D.
SAN FRANCISCO

In 1893, George Dock [1] published his first report of a case of chloroma. At this time, he was able to find reports of only sixteen similar cases in the literature, the first one being by Burns [2] in 1823. As Dock pointed out in his most interesting report, it was von Recklinghausen, in 1885, who first suggested the close relationship between chloroma and leukemia. In 1904, Dock and Warthin [3] summarized twenty-one cases reported in the literature from 1893 to 1904. They found the following important facts: (1) males were affected more frequently than females; (2) the ages of the patients ranged from 10 months to 52 years, with a majority in early life; (3) the duration of the disease varied from one to eighteen months; (4) the head was affected in all but two cases, and (5) the marrow of the long bones was involved in seven of the twenty-one cases. Their article contains a most exhaustive discussion of both clinical and pathologic aspects of the disease. In the twenty-five years which have elapsed since this article was published there seems to have been no evidence produced to alter their conclusion that "chloroma is a tumor-like hyperplasia of the parent-cells of the leucocytes, primary in the red marrow, the periosteum being secondarily involved. The possibility of a primary chloroma in any part of the body in which white cells are formed must be considered."

In 1910, Lehndorff [4] was able to find reports of seventy-three cases in the literature to that date. Although fifty-six were reported as lymphoid and only seventeen as myeloid, he felt that many of the so-called lymphatic chloromas were wrongly diagnosed. While he

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* From the Department of Pediatrics, University of California Medical School.

1. Dock, G.: Chloroma and Its Relation to Leukemia, Am. J. M. Sc. **106**:152 (Aug.) 1893.

2. Burns, Allen: Observations on the Surgical Anatomy of the Head and Neck, American ed. 1, Baltimore, 1823, p. 386, quoted from Dock (footnote 1).

3. Dock, G., and Warthin, A. S.: A New Case of Chloroma with Leucemia with a Study of Cases Reported Since 1893, Med. News **85**:971 (Nov. 19), 1025 (Nov. 26), 1078 (Dec. 3) and 1118 (Dec. 10) 1904.

4. Lehndorff, H.: Chloroma, Ergebn. d. inn. Med. u. Kinderh. **6**:221, 1910.

stressed the greater frequency of the myeloid, he did not deny the existence of a lymphoid type. From the first report of a case of myeloid chloroma in 1903 and 1904 by Türk [5] and Sternberg,[6] there has been a steady increase in the percentage of myeloid chloromas mentioned in the literature.

During the last fifteen years there has appeared to be a growing tendency to classify chloroma as a form of myelogenous leukemia. Burgess,[7] in 1912, pointed out the difficulties encountered in differentiating early myeloid cells from those of lymphoid origin, as well as the inadequate data available in a majority of the reports of cases of "lymphoid chloromas." His conclusion was that chloroma is always myelogenous. In 1917, Boots [8] reported an interesting case of myelogenous chloroma in a man 36 years old. At this time, he collected reports of sixty-nine cases published since 1893, bringing the total to eighty-six from 1823 to 1917. Boots, believing that most, if not all, cases of chloroma were myelogenous, suggested the more general acceptance of Sternberg's [9] classification, referring to such cases as "chloroleukosarcoma," thus including a reference to the green color, a reference to the relationship to leukemia and a reference to the tumor-like nature of the process, all in one term.

In the same year, 1917, Askanazy [10] published the results of his researches into the nature of chloroma. He stated his belief that all chloromas are myeloid, and that they are "malignant tumors derived from the formative cell of pus." He admitted that they might belong in the same classification as myelogenous leukemia, but preferred to keep the two as separate entities until there were more accurate data concerning the pathogenesis of leukemia as well as of the whole group of malignant neoplasms.

A most complete review of the literature from 1910 to 1926 is contained in the report of a case of myelogenous chloroma by Brannan.[11] Of a total of seventy-four cases, he considers fifty-six as being true

5. Türk, W.: Acute Myeloid Leukemia with Greenish Color of the Bone Marrow, Mitt. d. Gesellsch. f. inn. Med. u. Kinderh. **2**:39, 1903, quoted from Lehndorff (footnote 4).

6. Sternberg, C.: Concerning the Knowledge of Chloroma (Chloromyelosarkom), Beitr. z. path. Anat. u. z. allg. Path. **37**:437, 1904, quoted from Lehndorff (footnote 4).

7. Burgess, A. M.: Chloroma, J. M. Research, n. s. **22**:133, 1912-1913.

8. Boots, R. H.: Chloroma: with Report of a Case, J. Lab. & Clin. Med. **2**:622 (June) 1917.

9. Sternberg, C.: Leukosarcoma and Myeloblastic Leukemia, Beitr. z. path. Anat. u. z. allg. Path. **111**:73, 1916, quoted from Brannan (footnote 11).

10. Askanazy, M.: Personal Researches on the Nature of Chloromata, Internat. Clin. **1**:67, 1917.

11. Brannan, D.: Chloroma; Recent Literature and a Case Report, Bull. Johns Hopkins Hosp. **38**:189 (March) 1926.

chloromas. The classification of these revealed forty-nine myeloid, one lymphoid and six doubtful. Brannan concluded that "chloroma or chloroleukemia is a myelogenous process; an unusual form of myelogenous leukemia" . . . and that "aleukemic stages are common whereas proven aleukemic forms of the disease are very rare."

At present there would seem to be few workers who do not classify chloroma with the leukemias. The chief point which remains controversial is whether all chloromas are myelogenous or whether there may be a lymphatic form corresponding to lymphatic leukemia. Of seven cases reported by Feer [12] in 1927, three were classed as lymphoid. In the first of these, in a boy aged 10 months, there was a preponderance of lymphocytes in the blood smears, but as no oxidase stain or other differential method is mentioned, one might be justified in questioning the certainty of the diagnosis. Following an autopsy on this child, the final pathologic report was "lymphosarcoma." Whether or not one should be allowed to call this a case of chlorolymphosarcoma seems doubtful. Feer's second case was that of a boy, aged 2½ years, with orbital tumors, leukopenia and small lymphocyte percentages of 90, 43 and 97 on three different occasions. Naegeli, himself, saw the smears of blood from this patient and felt no hesitation in committing himself on the diagnosis of lymphochloroma. Here, again, the question may be raised as to whether it is safe to put too much confidence in the percentage of lymphocytes when there was a leukopenia, since the total number of lymphoid cells may have been normal, the deficit in the leukocyte count being due to the withdrawal from the circulation of the myelogenous cells. The third case showed 84 per cent lymphoblasts and the report of the autopsy described extensive lymph node "metastases" of a "lymphochloroma." As no mention is made of an oxidase stain or any method for differentiating early lymphocytes from early myelocytes, the certainty of this diagnosis must also be questioned. The difficulty of such a differentiation is well illustrated by another case reported by Feer [12] in which a count of 81 per cent lymphoblasts was subsequently changed to 46 per cent myeloblasts. In this case, the oxidase stain was reported first as negative and then as positive. From Feer's summary, I choose only the following: "einzelne kindliche Chloroleukämien sind sicher lymphatisch," (isolated cases of chloroleukemia in childhood are surely lymphatic).

In further support of this contention are two other case reports in the recent literature. Allen [13] presented the case of a boy, aged 4½ years, with typical orbital tumors and a leukocyte count of 84,000. During life this case was classed as myelogenous, but at autopsy, in

12. Feer, E.: Seven Cases of Chloroleukemia in Children, Jahrb. f. Kinderh. **116**:155 (June) 1927.

13. Allen, F. M. B.: A Case of Chloroma in a Child, Brit. M. J. **2**:553 (Sept. 25) 1926.

spite of the presence of the characteristic green color, the tumor processes turned out to be definitely "lymphosarcomatous." The other case, reported by Herz,[14] was in a boy aged 11 years, whose blood showed from 10,000 to 15,000 white blood cells with a preponderance of lymphocytes and an aplastic type of anemia. Unfortunately, no mention is made of any adequate differentiation of the immature white cells, so that one is forced to classify this as a doubtful case.

There is a great deal of evidence in support of the contention that all chloromas are myelogenous. The difficulty of distinguishing immature myelocytic cells from those of lymphoid origin lays the burden of proof on the one who reports a case of lymphatic chloroma. Not only is a vast preponderance of myeloid forms reported in the recent literature, but a number that have been considered as lymphatic have turned out to be myeloid when more careful or more complete studies could be made. In the case cited by Gamble,[15] the first differential count showed 85 per cent early lymphocytes, but a few days later the count, on a smear prepared with an oxidase stain, revealed 56 per cent myelocytes and only 34 per cent lymphocytes. In 1926, I had a similar experience with a case[16] which I was enabled to examine through the courtesy of Dr. Bilderback of Portland. In this instance, the oxidase stain, having been made up with stains which were not fresh, failed to give the usual reaction, thus misleading us into making a false diagnosis of lymphatic chloroma. Subsequently, with fresh stains, the typical oxidase granules were clearly demonstrated in a majority of the immature cells. The case reported by Foote and Jones[17] is in further support of the classification of chloroma as an atypical form of myelogenous leukemia. The work of Mathews[18] on leukochloroma in fowls is also of some interest in this connection. In demonstrating the similarity between this disease in fowls and chloroma in man, he has lent support at the same time to the theory of the myelogenous nature of chloroma, since this tumor-like process in fowls apparently bears no relation to either lymphocytoma or the various fowl infections and is invariably of myelogenous character.

Since Brannan's[11] review of the literature in 1926, I have been able to find thirty-seven reports of cases of chloroma. At least thirty-

14. Herz, O.: Aplastic Anemia and Chloroma, München. med. Wchnschr. **73:** 868 (May 21) 1926.

15. Gamble, R. C.: Chloroma, Illinois M. J. **52:**466 (Dec.) 1927.

16. Lucas, W. P., and Washburn, A. H.: Blood and Blood-Building Organs, in Clinical Pediatrics, New York, D. Appleton & Company, 1926, vol. 11, p. 170.

17. Foote, N. C., and Jones, G.: Myelogenous Chloroma; Report of a Case with Necropsy, Am. J. Dis. Child. **25:**379 (May) 1923.

18. Mathews, F. P.: Leukochloroma in Common Fowl; Relation to Myelogenic Leukemia and Analogies to Chloroma in Man, Arch. Path. **7:**442 (March) 1929.

two of these reports contain sufficient data to leave no doubt as to the correctness of the diagnosis. This gives a total of 162 reports of cases of chloroma which have found their way into the literature from 1823 through June, 1929, with the possible addition of about twenty reports of doubtful cases. Of the thirty-two authenticated cases reported since 1926 there are only six which may have been lymphoid, and, of these, only two [19] in which the evidence seems at all conclusive.

Two reports were made during the year 1928 which seem worthy of special mention. Castorina [20] presented résumés of three classic cases of chloroma in children aged 10 months, 2 years and 5 years. Two of these were typically myelogenous, while the diagnosis in the third was doubtful since there were so many immature mononuclear cells as to make differentiation less certain. In this connection, the author discussed the primitive cell type referred to by some as "lymphoidocyte" and by others as "hemoblast," stressing the great difficulty of attempting any differentiation of such cells into lymphoid or myeloid forms. The second article, by Lecène,[21] represents the only instance of apparent recovery from chloroma which I have been able to find reported in the literature. His patient, a young man, aged 23 years, had a tumor of the upper end of the humerus. The tumor, when excised, showed grossly a green color described as "coleur vert pomme," while the microscopic sections showed a homogeneous myelocytic tumor which corresponded with the usual picture seen in myelogenous chloroma. The blood showed only a mild anemia and "little change in the leukocyte picture." Following surgical removal of the tumor, the patient had six exposures to the deep roentgen rays. Two years after operation, the patient appeared to be in good health without any evidence of either local or metastatic recurrence.[22]

Aside from the statistical value of reporting cases of such a relatively rare disease as chloroma, the chief justification for the following report lies in the apparently complete recovery following roentgen therapy. Feeling that the disease process in this instance was so generalized as to make a permanent cure extremely improbable, I postponed reporting it while waiting for the expected recurrence of symptoms or signs. Two and a half years have elapsed so uneventfully that I believe it is worth while to give a preliminary report at this time to be followed by a final report should the patient suffer a recurrence of the disease at some future date.

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19. One of Feer's cases (footnote 12) and Allen's case (footnote 13).

20. Castorina, G.: Three Cases of Chloroma, Pediatria **36**:15 (Jan.) 1928.

21. Lecène, M. P.: A Case of Chloroma of the Upper End of the Humerus, Treated by Resection. Healing Maintained at the End of Eleven Months, Bull. et mém. Soc. nat. de chir. **53**:1328 (Nov. 30) 1927.

22. Lecène, M. P.: Personal communication to the author.

REPORT OF CASE

History.—K. D., a white boy, aged 22½ months, was admitted to the University of California Hospital on Sept. 29, 1926, with a tumor of the head. The family history revealed only two points of interest: (1) the patient's father had had active pulmonary tuberculosis ever since the patient was born and yet had lived with him continually; (2) the patient's sister died of tuberculous meningitis at the age of 2 years when the patient was 2½ months old. The patient was a normal baby in every way until his third month; then the left middle finger became red and swollen, and his physician made a diagnosis of "tuberculosis of the bone," incised the finger and scraped the bone. The lesion healed slowly over a period of months. But there was no further event of importance until the tenth month;

Fig. 1.—Photograph of boy 22½ months old, showing chloroma, October, 1926. Note pallor, anxious facies and tumor.

at this time a lump appeared on the left frontal region of his head. This gradually increased in size for a couple of months and then again decreased, so that from the age of 15 months to that of 18 or 19 months, according to the parents' assertion, there was no visible tumor mass. But during the two months which preceded his admission, the mass again made its appearance, increasing slowly until it was about the size of half of a small orange. His general health did not seem to be affected to any marked degree until the recurrence, two months before admission. Until that time his appetite had remained good and his gain in weight satisfactory, nor had untoward symptoms of any kind been noted. However, for six weeks before admission, he had seemed fretful or listless, had frequently refused his food and looked pale. His weight had remained almost stationary, and he had started to complain of pain and tenderness in his right leg, favoring it on walking and refusing to sit down on hard chairs.

Fig. 2.—Roentgenogram of skull taken October, 1926. Note erosion of outer plate.

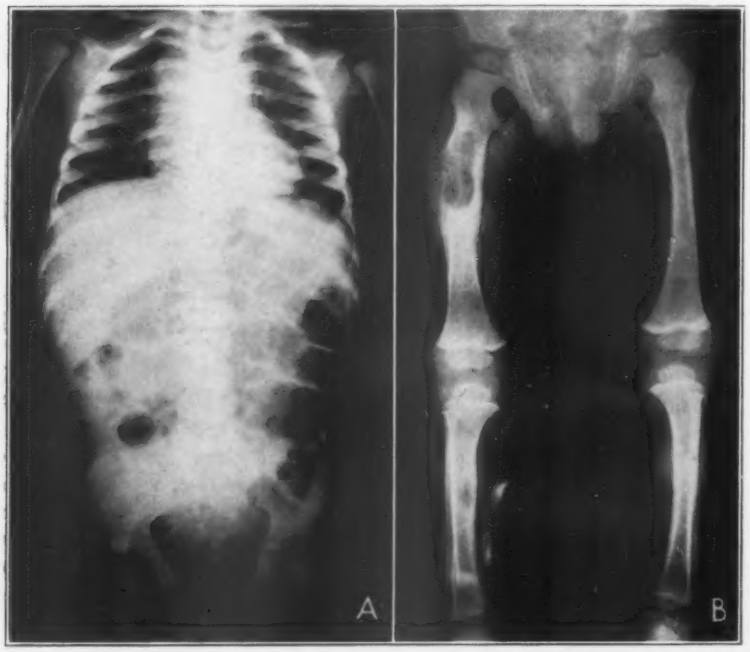

Fig. 3.—*A*, roentgenogram of chest taken in October, 1926. Note supracardiac mediastinal shadow. *B*, roentgenogram of bones of legs taken in October, 1926. Note extensive involvement of right femur and tibia.

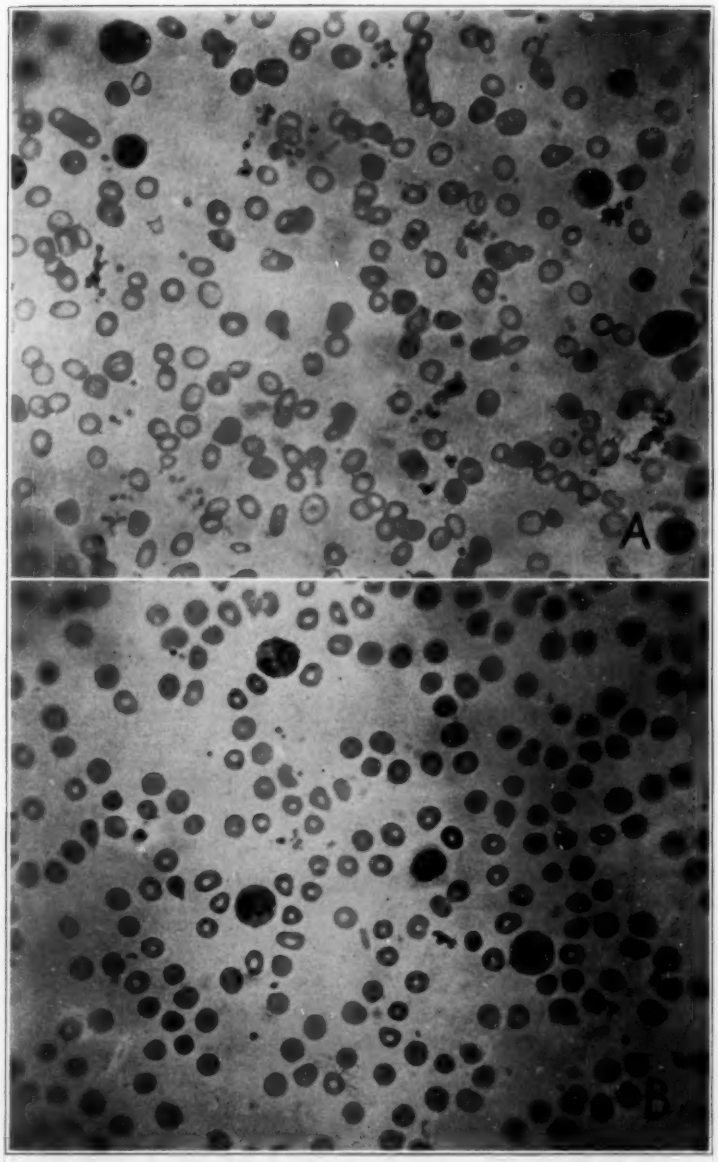

Fig. 4.—Photomicrographs of blood smears showing neutrophils in various stages of maturity. *A*, smear of December, 1926, stained with Wright's stain; *B*, smear of September, 1928, stained with combined Wright's and oxidase stain.

Physical Examination.—On admission, the child was well developed and nourished, but pale and irritable. Practically the only positive observation was that of the tumor mass in the left frontal region. This was about the size of half of a small orange, with the overlying skin discolored grayish; the mass was firmly attached to the underlying periosteum and was soft and elastic to palpation (fig. 1). There was some question whether it might not contain fluid, although there was no definite fluctuation but more the sensation of soft granulation. A hard, raised bony ridge could be felt along the outer edge of the mass. Dilatation of the superficial veins was also noted in this region of the scalp.

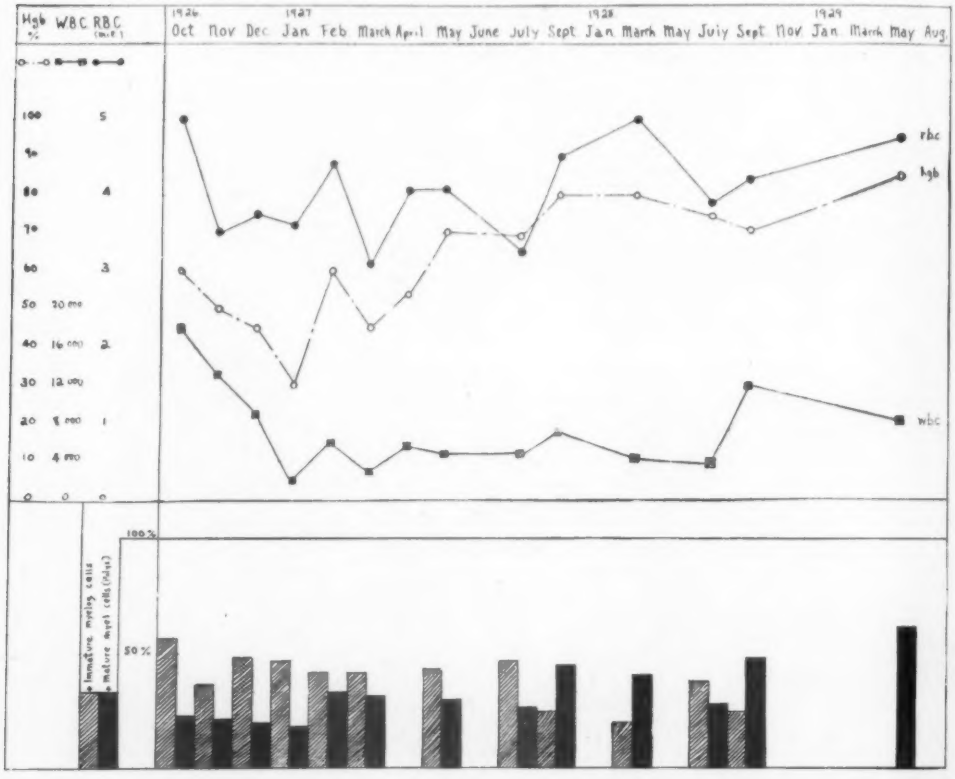

Fig. 5.—Course of the blood counts in case of chloroma during course of treatment with roentgen rays.

Laboratory Examination.—Roentgenograms of the skull revealed erosion of the outer plate by the tumor (fig. 2). Those of the lungs showed a large mediastinal mass (fig. 3*A*), interpreted as lymph node metastases. The roentgenograms of the long bones brought to light a destructive lesion of the right femur—apparently a metastatic tumor growth. There was also demonstrated a small area of decreased density in the lower end of the tibia (fig. 3*B*).

Before the metastases in the long bones were demonstrated, the diagnosis was thought to lie between granuloma and neoplasm. But the roentgen observations, plus negative results in the tuberculin and Wassermann tests, seemed to narrow

the diagnostic problem to a question of what type of new growth the patient had. Sarcoma, myeloma and chloroma were considered. Therefore, the examination of the blood was of great interest. During the first week after admission there was a persistent preponderance of granular leukocytes, in itself abnormal at this age. In addition there were from 5 to 22 per cent myelocytes on different smears. And on every smear there were always from 1 to 2 per cent large primitive "blasts,"

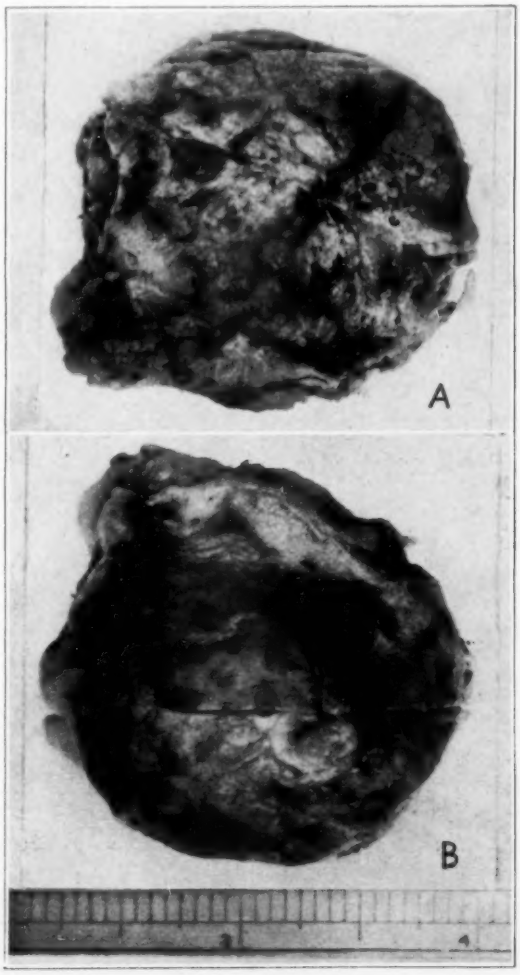

Fig. 6.—Photographs of tumor of skull: *A*, skull surface; *B*, skin surface.

undifferentiated cells with deep blue cytoplasm and large, round, purple nuclei. The red cells showed moderate variations in size, shape and staining. The platelets seemed definitely increased on the smear. The red blood count was 5,000,000, the hemoglobin content from 60 to 65 per cent, the white blood count from 15,000 to 25,000, the polymorphonuclears from 42 to 82 per cent, the myelocytes from 5 to 26 per cent (fig. 4), the lymphocytes from 18 to 30 per cent and primitive blasts from 1 to 3 per cent (see figure 5 for complete blood counts).

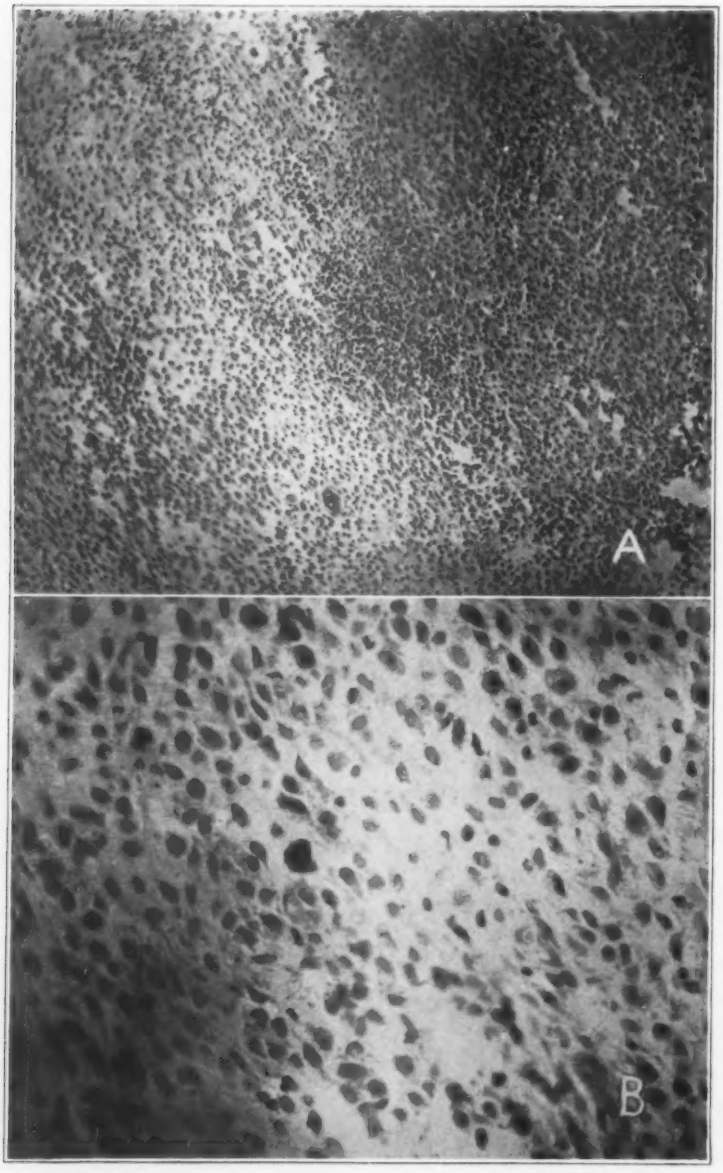

Fig. 7.—Photomicrographs of sections from tumor of the skull: *A*, under low power; *B*, from right lower quadrant of same field, under high power.

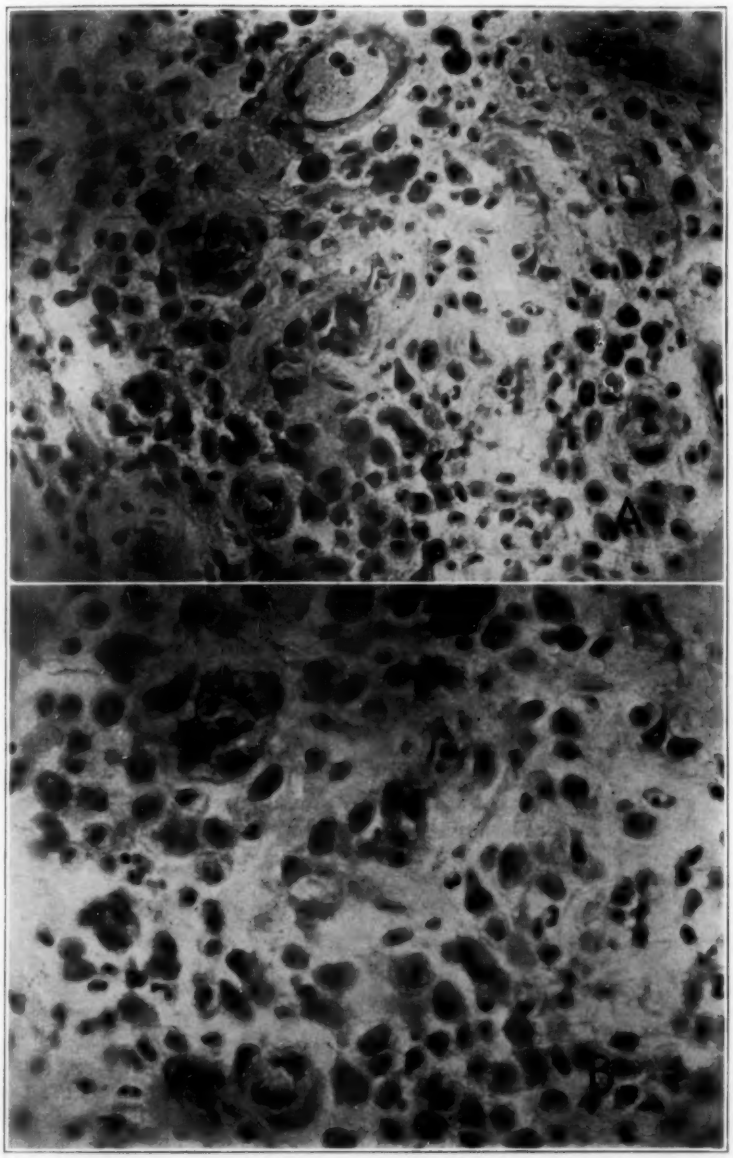

Fig. 8.—Photomicrographs of sections from polyps removed from ear: *A*, with high power; *B*, with oil immersion lens.

Four days after admission, a needle was inserted into the center of the tumor mass, and about 3 cc. of yellowish cloudy fluid was aspirated, after changing the position of the needle several times. A smear made from this fluid for a differential count was stained with both Wright's stain and a combined oxidase and Wright's stain and showed: polymorphonuclear neutrophils 41 per cent, lymphocytes 5 per cent, eosinophils 11 per cent, unclassified mononuclears (containing oxidase granules) 34 per cent and large undifferentiated blasts 9 per cent. There were about twice as many red blood cells as white blood cells on the smear and five nucleated forms were seen, two of which were megaloblasts.

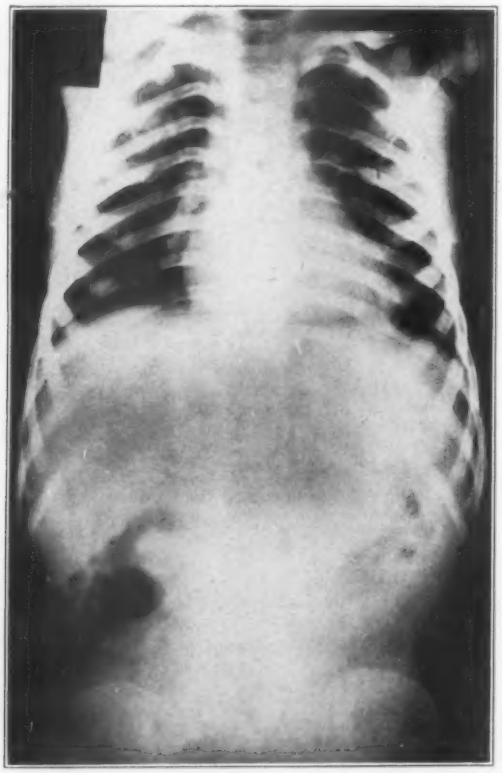

Fig. 9.—Roentgenogram of chest, taken in March, 1927. Note disappearance of mediastinal mass (see fig. 3 *A*).

Tumor.—Fifteen days after admission of the patient, Dr. Naffziger operated on him, not so much with any hope of cure as in order that we might, if possible, establish a certain diagnosis. On exposure, the tumor was found to be soft, lobulated and a dirty olive green. It invaded the underlying bone extensively and was apparently malignant. The tumor was separated from the bone, which was then scraped and cauterized (fig. 6).

Pathologic Report: The green color noted at the time of the removal of this soft lobulated tumor had faded out about one hour later, but on section the freshly cut surface presented again a dirty grayish green. While still fresh a small bit

of the tumor tissue was pressed out between two glass slides, dried and stained with both Wright's stain and a combined oxidase and Wright's stain.[23] These smears showed a predominance of immature myelogenous cells, the great majority containing oxidase granules. The microscopic sections of fixed tissue revealed a delicate, loose network of stroma with large masses of cells showing no tendency to any orderly arrangement (fig. 7 *A*). A few of these cells were either eosinophilic or neutrophilic polymorphonuclear forms, but the vast majority appeared to be myelocytic forms of varying size and degree of maturity. These

Fig. 10.—Photograph of patient in April, 1929, following course of treatment with roentgen rays. Compare with figure 1.

averaged about 10 microns in diameter, ranging from 5 microns to 15. Their nuclei were vesicular, varying from round or oval to irregularly kidney shape, and contained a fine chromatin network with a scattering of small chromatin masses (fig. 7 *B*). The nuclear membrane was clearcut, but the cytoplasm was rather hazy and vaguely granular. There were occasional giant cells each with two or more nuclei, and a rare mitotic figure was noted.

23. Washburn, A. H.: A Combined Peroxidase and Wright's Stain for Routine Blood Smears, J. Lab. & Clin. Med. **14**:246 (Dec.) 1928.

The conclusion from an examination of the microscopic sections was that we were dealing with a myelogenous tumor. The additional evidence gained from the gross appearance of the tumor and an examination of the smears from the fresh tissue seemed to justify the diagnosis of chloroma.

Course and Treatment Following Operation.—The patient stood the operation well, the wound healed nicely, and no particular change was noted in the patient's condition or in his blood picture for several weeks. We had planned to start roentgen therapy immediately after operation, but owing to same necessary repair work on the machine this was not actually begun until Dec. 6, 1926. In the accompanying table appears a complete record of the patient's exposures to the roentgen rays. No improvement was noted for about six weeks. Meanwhile, the patient began to complain of pain in both ears. Examination showed large polypoid growths in both ear canals. These were excised by Dr. Morrison and sent to Dr. Rusk for pathologic examination.

Record of Roentgen Treatments of Patient with Myelogenous Chloroma *

Date	Skin Area Exposed	Date	Skin Area Exposed
Dec. 6, 1926	Right femur, anterior	Feb. 18, 1927	Anterior mediastinum
Dec. 6, 1926	Posterior mediastinum	Feb. 18, 1927	Right femur, anterior
Dec. 7, 1926	Anterior mediastinum	Feb. 18, 1927	Right tibia, anterior
Dec. 7, 1926	Right tibia, posterior	Feb. 28, 1927	Posterior mediastinum
Dec. 7, 1926	Right thigh, posterior	Feb. 28, 1927	Right femur, posterior
Jan. 3, 1927	Left side of head	Feb. 28, 1927	Right tibia, posterior
Jan. 3, 1927	Anterior mediastinum	April 4, 1927	Anterior mediastinum
Jan. 3, 1927	Right thigh, anterior	April 6, 1927	Right femur, anterior
Jan. 3, 1927	Right tibia, anterior	April 6, 1927	Right tibia, anterior
Jan. 24, 1927	Posterior mediastinum	May 9, 1927	Anterior mediastinum
Jan. 24, 1927	Right thigh, posterior	May 9, 1927	Right femur, anterior
Jan. 24, 1927	Right tibia, posterior	May 9, 1927	Right tibia, anterior

* The roentgen therapy for this patient was outlined by Dr. H. E. Ruggles and carried out by Dr. C. B. Bowen in the University of California Roentgenology Department. It employed a distance, in each instance, of 12 inches (30.48 cm.), a filter ¼ copper, 1 aluminum, a spark gap of 9 and 100 milliamperes (except on date of Jan. 3, 1927, when this was 150 milliamperes) In view of the patient's poor condition and the widespread character of the tumor process, it seemed wiser to give a relatively long course of small doses rather than a shorter course of full trythema doses. (All except one of the treatments represented 50 per cent of the skin tolerance dose.) By such a regimen we hoped to arrest the progress of the disease without producing any untoward reaction in the patient. At the time of the patient's rapid improvement during February and March, it seemed safe to continue the same dosage of roentgen exposures until there was no more evidence of bone destruction. This situation was reached in May. Since his clinical condition at this time was also such as to suggest the complete quiescence of the disease process, further treatments were omitted in favor of a policy of careful watching for any further evidence of disease.

Grossly, the specimens consisted of two small, soft, dirty-gray polyps. Microscopic sections showed a loose stroma of fine strands of connective tissue with an irregular distribution of cells. These were mostly either polymorphonuclear neutrophils or early myelogenous forms with a scattering of cells with eosinophilic granules. There were occasional large multinucleated cells (fig. 8).

In the more densely cellular portions of the sections, the picture was practically identical with that found in the sections of the tumor removed from the patient's head. The conclusion was that we were dealing with the same type of tumor.

It was only after the examination of these specimens that Dr. Rusk concurred in the diagnosis of chloroma, although he had agreed that the first tumor was a myelocytic growth of some kind. At this point, January, 1927, clinicians, pathologists and roentgenologist all agreed on the diagnosis of chloroma.

The first evidence of improvement was on Jan. 18, 1927, when the roentgenograms were reported as showing "marked improvement in the way of new bone formation" in the right femur, and "no longer any widening of the mediastinal shadow" (fig. 9). One month later, the roentgenograms showed continued

improvement in both femur and tibia with no further change in the skull or chest. By this time there was a definite change for the better in the patient's general condition. He was now happy, eating well, beginning to gain weight and walking about a little without complaining of pain in his right leg. During the third month after the beginning of his treatment, his progress continued to be satisfactory. The only untoward effect was the development of a leukopenia with a mild secondary anemia. Two transfusions during this period served to keep the red cells at a level of about 4,000,000 (fig. 5).

The patient's condition was checked up in May, July and September, 1927. During this period the healing process in his bones continued, and there was no evidence of any recurrence of the disease. The only abnormalities in his blood were a mild leukopenia and a few myelocytes (fig. 5). During July, he had a

Fig. 11.—Appearance of patient in April, 1929, following course of treatment with roentgen rays. Compare with figure 1.

fever with diarrhea for two weeks while in a hot section of the state. But by September, he seemed to be in excellent health.

In March, 1928, ten months after the last treatment his health was still excellent. Roentgenograms at this time showed practically complete healing of all the bone lesions. Clinically, no evidence of disease was found. The only vestige of abnormality was a leukocyte count of 4,450 with 8 per cent myelocytes. The patient was seen again in June, August and December, 1928. At no time was there any sign of recurrent disease. In December, he was suffering from a mild infection of the upper respiratory tract, and showed a leukocyte count which was above normal for the first time since the start of the roentgen therapy.

At his last visits in April and May, 1929, there was a careful checking up of his physical condition and his blood and a complete roentgen study of his entire bony system. No signs of the previous disease were found. His physical examination gave negative results (figs. 10 and 11), except for a slight depression in the

Fig. 12.—Roentgenogram of skull taken in April, 1929. Note normal appearance (see fig. 2).

Fig. 13.—Roentgenograms of bones of legs taken in April, 1929. Note almost complete healing (see fig. 3*B*).

contour of the skull at the site of the original tumor, and a bruise of the soft tissue of the right forearm from recent trauma. His blood seemed to be within normal limits and was without any myelocytes for the first time since his first examination in 1926 (fig. 5). The roentgenograms of the bones (figs. 12 and 13) showed complete healing of the old processes without any evidence of fresh lesions. One felt justified in concluding that the patient was a normal healthy boy aged 4½ years. The prognosis given to the parents was optimistic, but still guarded.

COMMENT

The consideration of the differential diagnosis in this patient was of the greatest interest at the time of his first admission and becomes of even greater interest in view of his apparent recovery. The history of direct contact with tuberculosis during infancy, as well as the suspicious infection of the patient's finger at the age of 3 months, led us to make an original diagnosis of tuberculosis with a granulomatous tumor mass. But repeated intradermal tuberculin tests were always negative even with a dosage of 1 mg. of an old tuberculin that was giving positive reactions in children known to be tuberculous. The fact that the result of the Wassermann test of the blood was also repeatedly negative forced us to limit the diagnosis to the group of neoplasms which may involve the skull and long bones. One might consider these as chloroma, myeloma, suprarenal neurocytoma and Ewing's type of endothelioma, in that order of probability. The clinical observations, the roentgenograms and the presence of so many myelocytes all favored a diagnosis of chloroma or possibly some atypical form of myeloma. The pathologic study of the two biopsy specimens definitely ruled out both neurocytoma and endothelioma. The age of the child, the location of the tumors, the green color of the fresh specimen and the number of myelocytes in the blood stream all seemed to clinch the diagnosis of chloroma, so far as it is possible to do so without an autopsy. At any rate, one felt safe in stating that the prognosis was practically hopeless.

Roentgen therapy was tried merely as a last resort because of the natural desire to do something for the patient, not with any faith in its curative power. It is possible that some one else may have tried such treatment in chloroma in similar dosage, but I have failed to find any mention of a similar regimen and have therefore given a complete list of the exposures in the accompanying table. Certainly, one was unable to escape the conclusion that the patient's recovery was directly dependent on the treatment given. The question of whether or not a permanent cure has been effected must await the final verdict of time. Whatever this final answer is, it seems worth while to present at least this preliminary report on the course and treatment with the hope that similar therapy may be given a trial in other cases of chloroma.

SUMMARY

A review of the literature through June, 1929, shows at least 162 cases of chloroma reported since 1823.

Although the majority of recent cases have been myelogenous and there is much evidence in favor of the classification of chloroma as a form of myelogenous leukemia, it does not seem possible to deny the probable existence of lymphatic chloroma.

I have presented a case of myelogenous chloroma, in a boy aged 20 months, in which the diagnosis was established by complete blood, roentgen and pathologic studies.

Following roentgen therapy an apparently complete cure resulted, which has persisted for two and one-half years.

CONGENITAL MIRROR PICTURE DEXTROCARDIA WITH SITUS TRANSVERSUS, PATENT DUCTUS ARTERIOSUS AND SUBACUTE BACTERIAL INFLAMMATION *

IRVING MATUSOFF, M.D.
BROOKLYN

Subacute bacterial endocarditis superimposed on a congenital cardiac anomaly is not an uncommon occurrence. Cardiac, arterial or valvular malformations are liable to become the seat of acute inflammatory processes. The explanation offered is that the malformation or the sclerosis of tissue becomes a suitable place for the growth of organisms that may at times circulate in the blood stream. Abbott [1] said that bacterial endocarditis occurred in 20 per cent of cases of patent ductus arteriosus; in 25 per cent of high patent interventricular septal defects; in 33 per cent of defects of the lower part of the interauricular septum; in 24 per cent of cases of pulmonary stenosis, and in 42 per cent of cases with fused semilunar cusps. In a total of 555 cases of congenital cardiac disease of clinical significance, endocarditis occurred in 98 cases (17.6 per cent).

Inflammation of the pulmonary artery with no involvement of the valves of the heart, in a patient with a congenital anomaly of the heart, is a rarity. I have been able to find the records of three such cases.[2] Nowhere have I noted the particular association found in this case: a congenital mirror picture dextrocardia with situs transversus, patent ductus arteriosus, subacute bacterial inflammation and no apparent involvement of any valve of the heart.

REPORT OF CASE

G. S.,[3] aged 11 years, was admitted to the hospital on Feb. 19, 1928, and was discharged on March 25, 1928. The patient complained of fever of three months' duration and of precordial pains that had come on two weeks before admission. She had had heart trouble since the age of 4 years.

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* Submitted for publication, Jan. 28, 1929.

* From the Department of Pediatrics, The Jewish Hospital.

1. Abbott, M. E.: Incidence of Bacterial Inflammatory Processes in Cardio-Vascular Defects, Ann. Clin. Med. **4**:189 (Sept.) 1925.

2. Krysyskowski, J.: Aneurysma des Stammes der Pulmonalarterie und multiple Aneurysmen ihrer Verästelungen bei Persistenz des Ductus botalli, Wien. klin. Wchnschr. **4**:92, 1902. Hamilton, W. F., and Abbott, M. E.: Patent Ductus Arteriosus with Acute Infective Pulmonary Endocarditis, Tr. A. Am. Phys. **29**: 294, 1914. Schlaepfer, K.: Chronic and Acute Arteritis of the Pulmonary Artery and of the Patent Ductus Arteriosus, Arch. Int. Med. **37**:473 (April) 1926.

3. Dr. Benjamin Kramer permitted me to report this case.

History.—The parents of the patient were both living and well. Three other children had been born; one died at the age of 10 weeks, and the other two were living and well. The paternal grandmother had heart disease.

The patient was born at full term; delivery was normal. The neonatal history was normal, as was the history of development and feeding. The patient had pneumonia at the age of 4 years, and she was told at that time that she had a weak heart. She had measles at 1 year and whooping cough at 3 years of age, and had undergone tonsillectomy five years previous to admission. She had infrequent attacks of tonsillitis before and after the tonsillectomy, but otherwise she had no history of cardiorespiratory symptoms.

The patient's mother knew that the child had had a weak heart since the age of 4 years. There had been, however, no symptoms referable to the cardiovascular system. Occasionally, the patient would have slight puffiness of the lower eyelids. About three and one-half months before admission, the patient appeared weak and run down and was taken to a physician who told the mother that the child had heart disease. She was put to bed for a few weeks. During this period, her temperature rose every afternoon to 105 F. She complained at times of chilliness, but did not have a definite chill. This continued for about two months, and at the end of this time the patient was allowed out of bed. One month previous to admission, she went back to school, apparently well. A few weeks later, she began to complain of precordial distress and had a temperature of 102 F. The condition at that time was diagnosed as pleurisy. A day later, she was unable to move her right arm on account of pain in the shoulder. There was no swelling or redness. The patient did not complain of growing pains, or shortness of breath, up to the time of admission.

Physical Examination.—The patient was a well developed and well nourished, pale girl. There was a slight cyanosis of the mucous membranes and fingertips. She showed evidence of recent loss of weight. She had no dyspnea or orthopnea. The eyes, ears, nose and throat were normal. There was visible carotid and venous pulsation in the neck. The anterior cervical glands were palpable. There was considerable fulness of the left side of the chest; the apical impulse was visible to the right of the sternum, and also palpable slightly inside of the right nipple. The midclavicular line was 6.5 cm. from the midsternum. The apex beat was 7.5 cm. from the midsternal line to the right, in the fifth intercostal space. The other border of the heart was 4 cm. from the midsternal line to the left. A systolic thrill was felt near the middle of the heart on the right side. A loud, rough, humming murmur continued throughout the systole and into a part of the diastole; it could be heard best in the second right intercostal space. The pulmonic second tone was markedly accentuated. The heart sounds were indistinct over the area where they normally are heard, but became distinct and loud over the right side of the chest. The first sound at the apex was distinct, clear and not muffled. The blood pressure was 94 mm. of mercury systolic and 56 mm. of mercury diastolic. There was slight dulness at both bases posteriorly, and diminished breath sounds. Below the right costal margin of the abdomen there was a firm mass extending for 2 fingerbreadths and having a distinct notch to the right of the epigastrium. The mass did not seem to be confluent with the liver which extended all the way over to the left upper quadrant. The mass was assumed to be the spleen; otherwise, the abdomen was normal. The extremities revealed no edema or clubbing, and the reflexes were normal. The skin showed no petechiae or subcutaneous nodules.

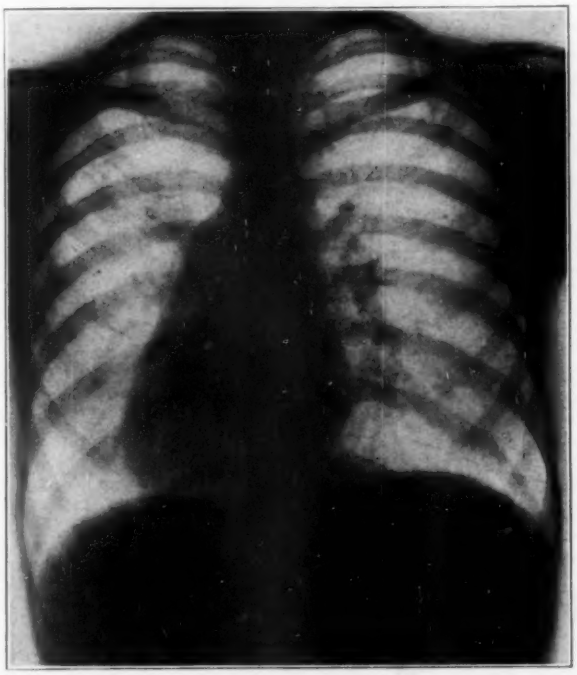
The clinical impression was congenital disease of the heart with complete situs transversus and subacute bacterial endocarditis.

Clinical Data.—On several examinations after admission the urine was normal. Examination of the blood on admission showed: hemoglobin, 50 per cent; red blood cells, 3,200,000; white blood cells, 10,700; polymorphonuclears, 77 per cent; lymphocytes, 18 per cent, and large mononuclears, 4 per cent. A culture from the nose and throat was negative and the tuberculin test gave negative results through 5 mg. The Wassermann reaction of the blood was negative.

A roentgenogram of the chest showed a complete situs inversus. There was an irregularity of the upper cardiac border in the pulmonic area which would well fit in with a patent ductus arteriosus. Both lung fields were normal.

The stomach was normal in size, but there was a transposition of the organ.

The electrocardiograph revealed a regular sinus rhythm. The ventricular rate was 90.



The heart is on the right side. There is an irregularity of the upper cardiac border in the pulmonic area which would well fit in with a patent ductus arteriosus. The fields of both lungs are normal.

In lead 1, the P wave, R wave and T wave were inverted. The P-R interval was 0.16 second and there was right ventricular preponderance.

Dextrocardia with the sinus (the pace-maker in this case) nearest the left arm was indicated.

Clinical Course.—On admission, the patient's temperature was 102 F.; it continued to fluctuate between 100 and 103 F. until she was discharged. On several occasions, blood cultures were found to be positive for *Streptococcus viridans.* The child was given a blood transfusion; two cultures taken after transfusion were negative, but subsequent ones were again positive, though with a lesser number of colonies. About three weeks prior to discharge, gross blood was found

in the urine, and the urine remained bloody until the patient was discharged. A few days after the discovery of red blood cells in the urine, several petechiae were found on the soft palate and on the upper part of the left arm. These disappeared within five days. About ten days prior to her discharge, the child complained of sharp pain in the right upper quadrant which was tender to palpation. This was assumed to be a splenic infarct. Three transfusions were given, with no apparent improvement in signs and symptoms. The blood cultures continued to be positive for *Streptococcus viridans*. The patient was always in an euphoric state of mind, playful, talkative, and ate and slept well. During the last week of her stay in the hospital, her color became distinctly greenish yellow. No new murmurs of the heart were heard. Two days prior to discharge, another blood transfusion was given.

On discharge, the diagnosis was complete transposition of the viscera, congenital disease of the heart, with possibly patent ductus arteriosus. Subacute bacterial endocarditis, embolic nephritis and infarct of the spleen were also present.

COMMENT

The diagnosis of patent ductus arteriosus was considered on the basis of the following points: (1) dulness in the upper spaces to the right of the sternum; (2) a thrill, systolic in time, over this area; (3) a markedly accentuated pulmonic second sound; (4) the roentgenographic shadow over the pulmonic area due to increased volume of the pulmonary artery; (5) a systolic murmur of the humming type, transmitted upward and to the right.

The diagnosis of subacute bacterial inflammation was considered because of: (1) the septic fever unassociated with any known focus of infection; (2) the enlarged spleen; (3) the emboli in the kidneys; (4) the petechiae, and (5) the positive blood culture of *Streptococcus viridans*.

It was believed that the bacterial inflammation was limited to the patent ductus arteriosus because:

1. There were present all the basic signs and symptoms of subacute bacterial endocarditis, with no known focus of infection in any other part of the body and no clinical signs of endocardial involvement.

2. At no time, and in spite of numerous examinations, were there any murmurs heard near the apex or the aortic areas.

3. The clinical signs in this case are similar to three other cases in which autopsy was performed.[2]

POSTMORTEM OBSERVATIONS IN THE NINETEEN CASES OF PATENT DUCTUS ARTERIOSUS WITH INFECTIVE PULMONARY ENDARTERITIS

1. Dilatation and hypertrophy of the heart were found in almost all cases. Hypertrophy involved both sides, with dilatation restricted mainly to the right side.

2. The mitral valve had fresh vegetations in five cases and chronic vegetations in four cases.

3. The aortic valve was damaged in thirteen cases.

4. All of the patients with mitral lesions had aortic lesions.

5. The aortic valve was involved alone in five cases, usually with fresh vegetations.

6. The tricuspid valve had fresh vegetations in one case, with vegetations on the mitral and aortic valve.

7. The pulmonary valve had vegetations in nine cases. In all of these cases, the stem of the pulmonary artery and the patent ductus arteriosus were the seat of an arteritis with thrombus formation.

In the remaining ten cases, the pulmonary valve was normal, but the pulmonary artery and the ductus showed a more or less extensive inflammation.

Three of the foregoing cases were unusual in that the arteritis was not complicated by valvular endocarditis.

In the cases with a pulmonary or other valvular lesion the arteritis was always accompanied by thrombosis, generally involving the anterior wall of the artery.

In all instances the vegetations were soft and polypoid.

In many cases of arteritis of the pulmonary artery, the chronic infection of the arterial wall produced a fusiform dilatation at the site of greatest damage.

The patent ductus was funnel-shaped, with a narrowing of its pulmonary orifice.

8. In the aorta was found, twice, a saccular aneurysm with atheromatous changes opposite the mouth of the duct.

9. In thirteen of nineteen cases, the lungs were the seat of infarcts.

10. A narrowing of the descending portion of the aorta was present in many cases.

SUMMARY

1. I have reported an unusual case of congenital mirror picture dextrocardia, with situs transversus, congenital developmental defect of the heart, probably patent ductus arteriosus and subacute bacterial inflammation, giving no clinical manifestations of the involvement of any valve of the heart.[4]

2. A summary is given of the postmortem observations in nineteen cases of patent ductus arteriosus with infection.

3. The frequency of subacute bacterial endocarditis in congenital cardiac disease is summarized.

1639 President Street.

4. The patient died on July 14, 1929. Permission for an autopsy could not be obtained.

CARDIOSPASM IN THE NEW-BORN INFANT*

LOUIS H. SEGAR, M.D.
AND
WALTER STOEFFLER, M.D.
INDIANAPOLIS

Cardiospasm in infancy and in childhood has been regarded, until recently, as a comparatively rare disease. Thirty-four of 691 consecutive cases recently reviewed by Moersch [1] at the Mayo Clinic occurred in children under 14 years of age, and 3 occurred during the first year of life. Messeloff and his associates [2] found eleven more cases in the literature, the youngest of these patients being 2 months. In several of these patients the histories suggested the possibility of the presence of cardiospasm within a few days or weeks after birth. With the exception of one patient seen by Chevalier Jackson,[3] we have found no reports of the occurrence of this disease in the new-born infant. Two cases seen by us within a short time suggest that its occurrence may be less rare than is commonly supposed.

REPORT OF CASES

CASE 1.—P. S., a girl, was born on June 14, 1928, weighing 7¼ pounds (3,288.6 Gm.). The labor was normal, and the baby nursed well and took from 1 to 2 ounces (30 to 60 cc.) of a complementary feeding after the first twenty-four hours. On the fourth day, the patient suddenly began to vomit during and immediately after feedings of milk or water. The vomiting was not of a forceful nature, its character rather suggesting an overflow. Just before vomiting the patient made several ineffectual attempts to swallow more of the formula and was plainly uncomfortable. Atropine, given subcutaneously, did not entirely check the symptoms although several feedings were reported to have been retained following its administration. The day following the onset a roentgen examination revealed the following: "Approximately 1 ounce of the barium sulphate mixture was taken without regurgitation. After the first two or three swallows, which went directly into the stomach, there was a definite stasis in the esophagus which remained there for an hour. No evidence of diverticulum was noted. At eighteen hours the esophagus and stomach were empty and the barium was scattered throughout the colon."

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* Submitted for publication, Sept. 18, 1929.

1. Moersch, H. J.: Cardiospasm in Infancy and Childhood, Am. J. Dis. Child. **38**:294 (Aug.) 1929.

2. Messeloff, C. R.; Shulman, H. I., and Buckstein, J.: Cardiospasm in Infancy and Childhood, Am. J. Dis. Child. **35**:427 (March) 1928.

3. Jackson, Chevalier, quoted by Jacques, P.: Ann. d. mal. de l'oreille, du larynx **45**:909 (Oct.) 1926.

After two days the vomiting became less frequent but occurred occasionally until the seventh day when it ceased altogether, and the use of atrophine, $\frac{1}{2.000}$ grain, which had been given subcutaneously every three hours, was discontinued. The baby lost 10 ounces (283.5 Gm.) during the first six days but had regained her birth weight on the fourteenth day.

At the age of 1 year the patient was apparently normal and recently, on reexamination, the contrast meal was observed to go directly into the stomach. She has vomited twice since the aforementioned trouble, during the course of a respiratory infection when 3 months old.

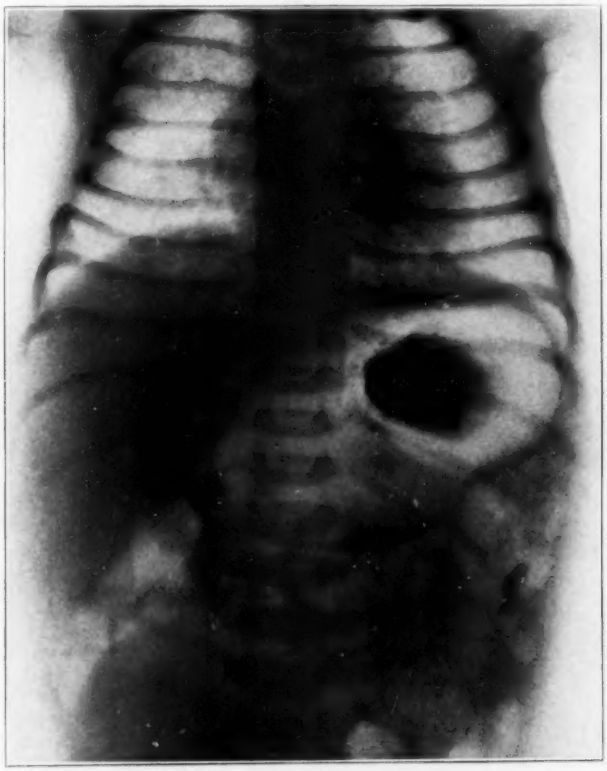

Fig. 1 (case 1).—Roentgenogram showing barium in the esophagus tapering downward to a point.

CASE 2.—B. K., a boy, was born on Feb. 26, 1929, weighing 7¾ pounds (3,515.4 Gm.). The delivery was complicated by a persistent occiput posterior position which necessitated manual rotation and midforceps delivery. There was no evidence of injury to the baby.

He nursed vigorously, and after twenty-four hours was given 1½ ounces (45 cc.) of a complementary feeding every three hours. The food was retained during the second day but on the third day everything taken by mouth was immediately regurgitated. After the administration of atropine sulphate, $\frac{1}{1.000}$ grain, given subcutaneously twenty minutes before feedings, had failed to relieve the condition, one of us (L. S.) was asked to examine the patient. The apparent dysphagia

after the first few swallows of water had been taken, and the immediate regurgitation of the same, called to mind the first patient, seen several months previously. A roentgen examination at this time gave the following information: "The roentgenogram following the ingestion of an opaque meal showed shadow-casting material in the stomach and also in the lower end of the esophagus, which tapered down to a fine point. A film taken one hour later showed barium still remaining in the esophagus, with a small amount remaining in the stomach, some having passed through the pylorus. A film taken after two hours showed a small amount remaining in the esophagus."

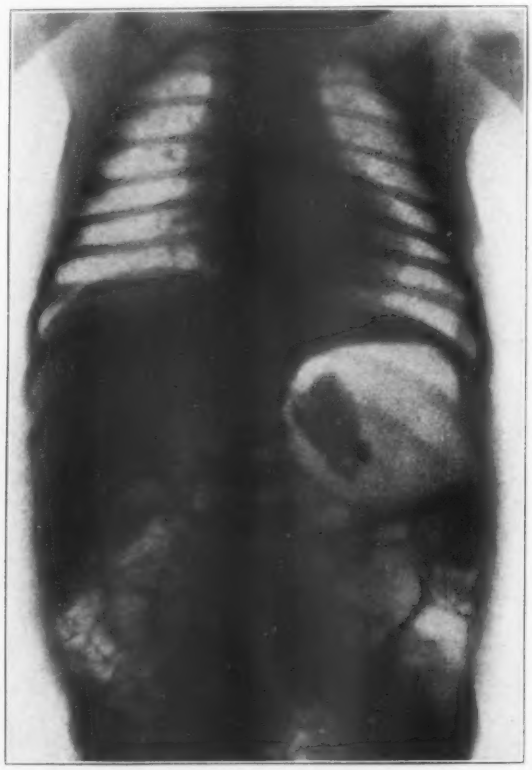

Fig. 2 (case 2).—The barium in the esophagus demonstrates a constriction at the level of the diaphragm. Films taken at one and two hour intervals showed some barium still remaining in the esophagus.

At this time the patient's weight had dropped to 6 pounds and 10 ounces (3,005.1 Gm.), 18 ounces (510.30 Gm.) less than his birth weight. Feeding by gavage was instituted, and the food was retained. After two days it was possible to omit the tube feedings and although occasional regurgitation occurred for several days longer, the infant gained steadily and weighed 7 pounds and 6½ ounces (3,359.475 Gm.) on the fifteenth day. At this time a screen study during ingestion of barium milk showed the material to pass through the esophagus directly and without delay into the stomach.

This infant is now 6 months old, is slightly more than his expected weight and has had no symptoms at any time which suggest a persistence of the disease.

COMMENT

There are numerous opinions as to the etiology and pathology of the syndrome called cardiospasm. The prevalent opinion that it is a purely functional disorder is challenged by the great variety of causes that have been found in the reported cases. Swallowing of air, hydrocephalus and pressure of a tuberculous tracheobronchial gland are given as causative factors in some of the cases reviewed by Messeloff.[2] In a considerable number of cases Mosher [4] found so-called cardiospasm to have been due to pressure from the liver, and considered the spasm a minor element. Guisez [5] also doubted the importance of the nerve factor in cardiospasm and he found ptosis of the abdominal viscera with consequent elongation of the abdominal portion of the esophagus in his cases. Sargnon [6] referred to a congenital valvular condition as an organic basis for the disorder, and P. Jacques [7] reported two cases in children in whom congenital syphilis was thought to be responsible for the cardiospasm. Finkelstein [8] reported the cases of rachitic infants whom he had observed to cough, who became cyanotic and vomited, the attacks usually appearing when gruel and vegetables were added to the diet. The condition was relieved by the administration of cod liver oil. He described the clinical picture as being one of "esophagism upon a spasmophilic basis."

That cardiospasm may depend on a neurotic element alone has been well established. In several instances the spasm has been relieved by hypnotic treatments.[9] The interesting cases of cardiospasm in children following the ingestion of lye [10] emphasize the neurotic element. In these cases vomiting did not begin for several months while organic strictures always develop from two to four weeks after the accident.

4. Mosher, H. P.: Liver Tunnel and Cardiospasm, Laryngoscope **32**:348 (May) 1922.

5. Guisez, Jean: Treatment of Phrenocardiospasm with Dilatation of the Esophagus, Presse méd. **32**:697 (Aug. 23) 1924.

6. Sargnon, quoted by Jackson, Chevalier: J. Laryng. & Otol. **38**:451 (Aug.) 1923.

7. Jacques, P.: L'oesophagisme chez l'enfant, Ann. d. mal. de l'oreille, du larynx **45**:909 (Oct.) 1926.

8. Finkelstein: Lehrbuch der Saüglingkrankheiten, Berlin, Julius Springer.

9. Beck: Spasmus am Oesophagsmund, München. med. Wchnschr. **65**:577 (May 21) 1918. Lust, quoted by Piekarek, W.: Deutsche med. Wchnschr. **47**: 1609, 1924.

10. Piekarek, W.: Oesophagospasmus im Kindesalter, Deutsche med. Wchnschr. **47**:1609 (Nov. 21) 1924.

All the patients recovered without treatment other than that directed toward dispelling their fears and illusions.

It becomes evident from such a review that cardiospasm may be either a functional disorder or one based on a definite organic disease, and that a diagnosis on the latter basis may often depend on a most complete examination, including direct examination of the esophagus.

In searching for an explanation of the disorder in our patients we were enlightened by the conception of the normal functioning of the esophagus given by Chevalier Jackson.[11] With this description he antiquates the older theories regarding the mechanism of cardiospasm. He believes that deglutition is normally controlled by a pinch-cock action of the periesophageal diaphragmatic structures, especially the sphincter-like prolongations of the crura, demonstrated by him to coexist with a kinking of the abdominal esophagus. There is a momentary relaxation of this pinch-cock action during deglutition, while at other times it is effective in preventing regurgitation from the stomach of the contained fluids. The act of swallowing, he pointed out, is a highly coordinated mechanism, and he expressed the belief that some cases of "phreno-esophagospasm" may be explained by a disordered coordination in the deglutitory cycle.

In both our patients the disorder was transient and has not recurred. It is therefore improbable that the cause was organic. A temporary disturbance incident to the first few days of life may have been conceivably a factor. We believe, however, that it is fair to assume that the disorder was based on a temporary incoordination of the mechanism of swallowing.

SUMMARY

1. Vomiting occurring in two new-born infants was found by roentgen examination to be due to a stenosis of the lower end of the esophagus.

2. The vomiting occurred immediately after a few swallows of any fluid were taken, the milk being unchanged in character. Dysphagia and discomfort were noted just before vomiting occurred.

3. The stenosis in these cases was apparently due to a temporary incoordination of the deglutitory cycle.

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11. Jackson, Chevalier: Peroral Endoscopy, J. Laryng. & Otol. **38**:431 (Aug.) 1923.

DERMATOPOLYNEURITIS WITH MOTOR PARALYSIS OF THE LOWER EXTREMITIES*

A. B. SCHWARTZ, M.D.
MILWAUKEE

Acrodynia is frequently characterized by a group of neurologic symptoms. Among such symptoms, Rodda [1] mentioned hyperirritability, sleeplessness, paresthesia, anesthesia, loss of reflexes, paresis and photophobia. These symptoms are so frequently present that recent writers agree on the term erythredemapolyneuritis as most descriptive of this disease.

Most reported instances have shown striking disturbances of the sensory nerve tracts. Fewer case reports [2] include descriptions of motor paralysis.

The present case is regarded as worthy of recording because of the outstanding manifestation of motor paralysis of the lower extremities. The subject of this report showed a complete flaccid paralysis of both lower extremities, a weakness and hypotonia of both the upper and the lower extremities besides the usual sensory disturbance.

The following history was obtained from the mother during the child's stay at the Milwaukee Children's Hospital, where she was admitted on Sept. 30, 1928.

REPORT OF CASE

History.—J. J., a girl, aged 2, of normal birth, apparently had been healthy previous to the present illness. The birth weight was 9 pounds (4.1 Kg.). She had been breast-fed for five months. No illness had occurred during the first year with the exception of occasional colds. Eruption of the teeth was slow, the first tooth appearing at the age of 1 year. The child began to walk shortly after the first year. During the second year, she had frequent colds and sore throats. During January, 1928, when 18 months of age, she had a severe sore throat with swollen glands in the neck and high fever which lasted for six weeks. This illness left no noticeable weakness, and during March her recovery was such that a trip to Pittsburgh was planned during April. A physician was consulted and saw no

* Submitted for publication, Sept. 27, 1929.

* From the Milwaukee Children's Hospital.

1. Rodda, F. C.: Acrodynia: A Clinical Study of Seventeen Cases, Am. J. Dis. Child. **30**:224 (Aug.) 1925.

2. McNeal, Morley D.: A Report of Five Cases of So-Called Acrodynia, Minnesota Med. **5**:153, 1922. Zahorsky, John: The Semeiology of the Pink Disease, J. A. M. A. **79**:1975 (Dec. 9) 1922. Paterson, Donald, and Greenfield, J. Godwin: Erythroedema Polyneuritis (The So-Called "Pink Disease"), Quart. J. Med. **17**:6, 1923. Goudsmit, J., and Rümke, H. C.: Ueber das Akrodynische Syndrom, Deutsche. Ztschr. f. Nervenh. **99**:225, 1927.

objection to the trip. At this time, the patient was 22 months old and weighed about 30 pounds (13.6 Kg.). Her robust appearance was a matter of comment. She had good color; she walked and ran and liked to crawl upstairs. She ate well, slept well and had regular habits of elimination. The trip on the train to Pittsburgh seemed no hardship to her. In Pittsburgh, during the third week in May, she seemed to tire easily. Her appetite was fairly good. She had profuse sweats and rubbed her feet at night. She was restless and had cold hands and feet. On returning home a physician was called who attributed the symptoms to the previous gland trouble. During June she had a rash over her entire body and her eyes seemed sensitive. The physician said that the rash was due to excessive perspiration. She slept a great deal both day and night. Her appetite failed, and she refused solid food, preferring milk and fruit juices. She showed a slight trembling, which became worse during July and August. The last week in June she was in the hospital for a suspected tuberculous infection. The reaction to the Pirquet test was negative, but the roentgenogram of the chest showed a "slight cloudiness on the left side." During July she lost weight and weakness increased. She had night and day sweats. The hands and feet were cold. Constipation was marked. She was not irritable if kept quiet. Involuntary voiding, with an increased amount of urine occurred. She asked to have her feet rubbed, especially at night. The weakness in the legs increased, and she walked as though her feet were too heavy; she could hardly run. During August, there was a slight improvement in the appetite. She had small ulcers in the mouth, and her lips peeled. There were excessive sweating and marked trembling. On August 28, it was first noticed that the child could not stand up. During September, she was again brought to the hospital for observation. She received ultraviolet ray therapy every other day. The condition was thought to be due to some pathologic condition of the tonsils. Noises were heard in the throat and chest. The temperature was 99.8 F.

Examination.—On the patient's admission to the Milwaukee Children's Hospital, physical examination showed a well developed, flabby muscled child lying in bed in a position of semihelplessness. She seemed weak. She was apprehensive of the examining physician. In following the examiner, the child moved her eyes rather than her head. The mentality was evidently clear. The pupils were equal and active. No nystagmus, strabismus nor palsies were noted. The ears and nose were normal. The buccal mucosa was reddened. The tonsils were small. Moderate cervical adenopathy was present.

The ribs were flaring. The lungs were resonant, and loud ronchi were heard in both infraclavicular regions. The heart rhythm was regular. The apex impulse was in the sixth interspace in the nipple line. No murmurs were heard.

No masses, spasm or tenderness were noted in the abdomen. The liver and spleen were not palpable. Abdominal reflexes were absent.

The hands were red and cold; the palms were desquamating. There was no evidence of paralysis, but a little weakness was present. Some wasting of gluteal muscles was noted in the lower extremities. The feet were red and cold and showed slight desquamation. Apparently there was some loss of sensation up to the knees. The patient was unable to move the lower extremities The knee reflexes were absent.

The following possible diagnoses were considered: (1) acrodynia; (2) polyneuritis, postinfectious; (3) chronic poliomyelitis and (4) progressive muscular dystrophy.

During the next week's observation, the patient's hands and feet peeled extensively and looked red and raw. The whole body showed a miliaria-like rash. The

child was constantly drenched in perspiration. She developed an area of alopecia over the left parietotemporal region. The knee reflexes remained absent. The apparent paralysis of the lower extremities continued. When an attempt was made to lift the child by placing the hands under her arms, her shoulders gave way. The sensation of the lower extremities was difficult to determine. Pin pricking could be made over numerous areas without eliciting any response.

The Wassermann and Kahn precipitation tests on the blood serum were negative. The blood sugar was 120 mg.; the serum phosphorus, 2.59 mg. and the serum calcium, 12.6 mg. The stools showed no parasites or ova. Urinalysis showed a faint trace of albumin, no sugar, no acetone and no diacetic acid. The blood examinations were as follows:

	Red Blood Cells	Hemoglobin	W. B. C.	Differential Count, per Cent
10/10/28	4,770,000	80%	14,300	Small lymphocytes, 23 Large lymphocytes, 1 Large mononuclears, 6 Neutrophils, 65 Eosinophils, 3
10/12/28	4,870,000	80%	8,800	Small lymphocytes, 28 Large lymphocytes, 5 Large mononuclears, 2 Neutrophils, 65
10/15/28	4,810,000	57%	13,500	Small lymphocytes, 22 Large lymphocytes, 18 Large mononuclears, 2 Neutrophils, 57
10/18/28	4,740,000	80%	16,400	Small lymphocytes, 17 Large lymphocytes, 5 Large mononuclears, 2 Neutrophils, 75
10/29/28	3,800,000	69%	12,600	Small lymphocytes, 12 Large lymphocytes, 18 Large mononuclears, 4 Neutrophils, 63

On September 23 the neurologic examination was made by Dr. Andrew I. Rosenberger. The left pupil was larger than the right; both reacted normally. Otherwise, the cranial nerves were normal. There was generalized flaccidity of the upper extremities but no definite atrophy. Generalized weakness was observed but there was no evidence of paralysis. Arm reflexes were equally present and normal. There was moderate atrophy of the buttocks but no other atrophy. Complete paralysis of the lower extremities was present with the exception of some plantar flexion of both feet. Tendon and plantar reflexes were absent. Sensation was apparently diminished over both the lower and the upper extremities.

Faradic stimulation of the muscles of the extremities gave no response except prompt reaction over the flexor muscles of the fingers and the plantar flexors of the feet. Strong faradic stimulation failed to produce any painful response.

The patient left the Milwaukee Children's Hospital on Nov. 1, 1928, with the advice to have the tonsils removed as soon as possible.

Subsequent course (personal communications from mother):

Nov. 17, 1928: Tonsillectomy was done.

Nov. 22, 1928: J. moved her left leg and since then has moved the toes on both feet and has bent both knees. There is hardly any sweating. She does not call for the continual foot-rubbing and seldom wrings her hands. The hands are still cold and damp.

Dec. 10, 1928: J. shows increased interest in toys and desire to play. She seemed better able to handle objects the first week after the tonsillectomy and since then has gained better control of her hands and arms. She has a fairly good grip, can feed herself a little and can pull herself up to a sitting position with just a

little help. There seems to be more firmness in the shoulders. She wants to sit up more. The hands are not so damp but are sometimes red and swollen. She still occasionally complains of her feet burning and is still restless at night.

Jan. 17, 1929: J. has learned to crawl and can move about all over her bed. She has also learned to sit up. Just this week, she began to walk backward in her walker. Her hands are still cold and red and slightly swollen in the morning. After she has been up a while, they warm up and become their natural color. She sleeps much better now that she can make herself comfortable in bed. She is no longer constipated. Her appetite remains poor, and she has shown no gain in weight. The guinea-pig inoculated with J.'s sputum was killed December 26, and no evidence of tuberculosis was found.

Feb. 3, 1929: J. walks about the house reaching from one thing to another although she can stand alone. The walk is unsteady but promising to us after nearly five months of paralysis. The hands are sometimes red and cold, and she shakes her shoulders nervously when excited. This and the fact that she is still pale and thin and is wobbly on her legs are our only reminders of her illness. She is happy and playful most of the time and sleeps well at night. Her appetite is fairly good, and she is seldom constipated.

April 11, 1929: J. walks and even tries to run. She goes up and down stairs and plays about all day long. Her shoulder muscles are strong, for we can lift her from the floor, taking hold of her elbows. All the symptoms seem to have gone except the bronchitis. She has had three attacks since Christmas.

May 26, 1929: J. weighs 31 pounds, 7 pounds over her lowest weight in November, 1928, and 6 pounds over her weight the day she left the Milwaukee Children's Hospital. The bronchitis still persists. Another thing I have noticed is her irritability. I suppose she is "spoiled," although I have tried to prevent it. I am at sea to know just how much discipline a child of J.'s experience needs.

In a recent report on the child's condition, the mother remarked, "I have tried to recall the things that impressed us as they happened and hope that this report may be of some use in the further study of this miserable disease."

On Aug. 29, 1929, the patient was brought in for a check-up. She had a recurrent tendency to bronchitis without fever or other symptoms. The child acted like a normal child except for an increased moisture of the entire skin which was noticed when the child cried. Neurologic examination showed nothing else unusual.

418 East North Avenue.

Progress in Pediatrics

CONGENITAL TRANSPOSITION OF CARDIAC VESSELS

A CLINICAL AND PATHOLOGIC STUDY *

KATSUJI KATO, M.D.
LOS ANGELES

Congenital transposition of the efferent vessels of the heart is defined by Abbott [1] as "an alteration in the position of the two great vessels relative to the ventricles of the heart or to each other at their origin, so that they either spring from reversed ventricles, the aorta from the right and the pulmonary artery from the left chamber (complete transposition) or from the ventricles to which they normally belong, but in a reversed relationship (corrected transposition)." The cases of congenital heart disease with marked cyanosis referred to by older writers as morbus caeruleus are for the most part due to this condition, as cyanosis, as will be considered later in detail, is here of the most extreme and persistent type. This anomaly must be clearly distinguished from the type of transposition of the entire organ together with the vessels, so that it is in reality either a complete mirror picture of the normal heart or a complete reversion of the organ on itself (dextrocardia with or without situs inversus and dextroversio cordis).[2] The form of defect that I am concerned with in this paper is the true transposition of the arterial trunks, with the normal arrangement of the heart chambers with or without septal defect (transpositio vera).

EMBRYOLOGIC CONSIDERATIONS

The mechanism that enters into the formation of the efferent vessels of the heart is one of the most intricate and complex in the embryology

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* From the Pathological Laboratories of the Children's Memorial Hospital, Chicago, Dr. William G. Hibbs, attending pathologist.

1. Abbott, M. E.: Congenital Cardiac Disease, in Osler and McCrae: Modern Medicine, ed 3, Philadelphia, Lea & Febiger, 1927, vol. 4, p. 716. This monograph by Abbott is undoubtedly the most complete modern presentation of the entire subject of congenital heart disease, comparable only to the older standard book by Peacock. Acknowledgment must be made at the outset for a rather free use of the data as assembled by this author.

2. There seems to be confusion on the part of the author who prints an autopsy picture of a case of complete visceral dextroposition, describing it as a eases of Infants and Children, ed. 2, Philadelphia, W. B. Saunders Company, 1926, vol. 2, p. 381.

of the circulatory system. As a rule, it will be seen that the more complicated the process, the greater are the chances for anomalies. Although the phenomenon of transposition of cardiac vessels may be understood to some extent by studying the mechanism of formation of the two arterial trunks, it is by far the least understood problem in the pathogenesis of congenital cardiac diseases.

At the outset it is well to bear in mind that the primitive heart is nothing but a series of five more or less differentiated blood spaces that are formed during the first two or three weeks of intra-uterine life. These primitive spaces are, in order of the direction of the blood flow which is from below up, (1) the sinus venosus, receiving the blood from the main primitive veins, (2) the atrium, (3) the ventricle, (4) the bulbus cordis and (5) the truncus aorticus, which empties its contents into the six ventral roots of the aortic arches. These chambers come to bend on themselves, making an S-shaped channel, with the atrium lying upward and backward and the ventricle forward and downward. The bulbus cordis passes upward and to the left and gives off the truncus aorticus from its right upper angle. The truncus aorticus is thus seen to occupy the most cephalic end of the series, discharging its contents into the ventral roots of the six aortic arches, the fifth of which is merely rudimentary. It is well to remember that the last (sixth) aortic arches, both right and left, are later to become the pulmonary arteries, the left one to participate in the production of the ductus arteriosus.

Of all these primitive chambers of the heart, the most important structures in explaining the transposition of vessels are the bulbus cordis and the truncus aorticus. The formation of the bulbus cordis is most interesting.[3] It is a transitory portion of the embryonic heart passing from the right side of the common ventricle to the left and upward, as seen in the human embryo of from 4 to 6 mm. in length (second to fourth week of gestation), lined with endothelium and presenting certain endocardial thickenings which are known as the proximal and distal bulbar swellings, spirally arranged, which are destined to form the anlagen of the semilunar cusps and also of the bulbar portion of the aortopulmonary septum proper.

Between the fifth and the eighth weeks of fetal life (the embryo of from 8 to 17 mm. in length), the sinus venosus is for the most part absorbed into the atrium, and the bulbus cordis is absorbed partly into

3. The significance of the bulbus cordis in the study of cardiac malformations was first brought out by Alfred Greil (Morph. Jahrb. **31**:123, 1903). This was later elaborated by Keith and was used as the basis in explaining the majority of cases of cardiac malformations (Keith, A.: Studies in Pathology, edited by William Bullock, 1906; also his Hunterian Lectures on Malformations of the Heart, Lancet **2**:359, 432, 519, 1909).

the ventricle and partly into the truncus aorticus. The part absorbed into the ventricle is loosely called its infundibulum and forms the basis of the right ventricle after the interventricular septum has appeared, while the part absorbed into the truncus aorticus adds to the length of that trunk.

The division of the truncus aorticus which has thus been elongated by the fusion of the upper portion of the bulbus cordis appears to start before the fifth week by a simultaneous evolution of three separate elements which enter into the process.[4] The first of these is the development of a sharp fold, the aortopulmonary septum proper, which grows at the angle between the orifices of the more dorsally situated sixth arches (which later become the pulmonary trunks) and the orifices of the two stems which form the ventral roots of the first four aortic arches. This septum grows rapidly downward in the lumen of the aortic trunk, dividing it into the two large vessels. At the same time, the second and the third elements are preparing themselves to unite with this downward progressing septum. These elements are the distal and proximal bulbar swellings, of which four belong to the distal and two to the proximal, known respectively as the distal bulbar swellings 1, 2, 3 and 4, and the proximal bulbar swellings *A* and *B*, of Born.

The fusion of these swellings with each other brings about the evolution of the spiral bulbar septum formed in clockwise fashion from above downward, which in turn unites at its distal end with the proximal end of the aortopulmonary septum proper. When this is completed, the truncus aorticus is no longer a single tube but contains a double channel, each completely separated from the other, and each being connected with its proper ventricle. The proximal bulbar swellings which are the structures nearest to the common ventricle, then, are prolonged still further downward into the ventricular region, and finally unite with the superior portion of the interventricular septum which grows upward from the floor of the common ventricle.

From this brief summary of the embryologic facts pertaining to the division of the efferent vessels of the heart, it becomes clear that the transposition of these vessels is due to one of two processes: either the normal torsion of the spirally-arranged aortic septum has failed to take place, making the two vessels two parallel straight tubes, or the position of the anlagen of the septum has been such as to prevent the formation of a normally spiral bulbar septum. In either case the result would be identical. Instead of assuming a spiral position, the septum takes on a straight course downward, and hence the pulmonary artery remains on the left side and the aorta on the right, connected with the left

4. Cunningham: Text-Book of Anatomy, New York, William Wood & Company, 1919, p. 1035.

and the right ventricles, respectively; that is, complete transposition occurs. The first of the aforementioned conditions is the hypothesis of Rokitansky,[5] advanced as far back as the year 1875, in which he distinguished two main classes of transposition, namely, corrected and complete. His first group (schema *A*) starts with the normal relation of the arterial trunks, in which the concavity of the septum is directed backward and to the right. Under this heading comes also the so-called "corrected" transposition, that is, the transposed vessels emerge from their normally related ventricles. The second group (schema *B*) starts with the complete transposition, transpositio vera, in which the arteries arise from reversed ventricles throughout. This form of anomaly, therefore, may be considered to originate in a supposed rotation of the septum through 180 degrees, so that its concavity looks downward and to the left.

Keith,[6] refusing to accept the theory of Rokitansky, attempted to explain the abnormal juxtaposition of aortic and pulmonary orifices with reference to the mitral and tricuspid valves, respectively, by assuming the abnormal involution of the bulbus cordis. He pointed out that in complete transposition, the left half of the bulbus cordis atrophies, bringing the pulmonary orifice into close juxtaposition with the mitral valve, whereas if the right half of the bulbus atrophies, the aortic orifice will be brought into juxtaposition with the mitral, which represents the normal course of development.

In the second condition mentioned it is assumed that the spirally arranged endocardial swellings on the lining of the bulbus cordis in the normal heart have, for some reasons not explainable, been abnormally placed, that is, instead of being spiral, they may be placed straight longitudinally. In this case there will not develop a spiral bulbar septum, but rather a vertical bulbar septum, which, when united with the proximal portion of the aortopulmonary septum proper, will divide the aortic trunk into two parallel vessels, without a twist.

Again, another consideration would lead to an hypothesis that a process of rotation may occur in a reverse direction, even when the distal and proximal bulbar swellings are spirally placed, a possibility that has been stated by Abbott and suggested by Frederic Lewis and by Keith.

On the whole, the factors that enter into the production of transposition are by no means simple, and there may be a series of events that occur in the course of this form of malformation, which are admirably enumerated by Abbott [7] as follows:

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5. Rokitansky, C. F.: Die Defekte des Scheidewände des Herzens, Wien, 1875, p. 78.

6. Keith, A.: Lancet **2**:433 (Aug. 14) 1909.

7. Abbott (footnote 1, p. 718).

(1) A reversal of the bulboventricular bend, so that the two great trunks resulting from the division of its distal aortic portion come to occupy a reversed relation to the auricular canal; (2) a reversal of the normal kinking of the aortic bulb so that it remains a straight tube or assumes a curve complementary to the reversed bulboventricular twist below; (3) a consequent reversal of the normal spiral arrangement of the bulbar endocardial ridges; and (4) a resulting malposition of the aortic septum so that its spiral twisting either does not take place, or takes place in a reversed direction, leading to a lack of the normal torsion of the great arterial trunks, that is, transposition.

The question of just which of these factors is the predominating one in a given case can never be settled theoretically. It seems certain, however, that the fundamental conception of Rokitansky, namely, the faulty torsion of the aortopulmonary septum, propounded over half a century ago, still stands unchallenged, and each new case adds strength and glory to its enduring principle.

INCIDENCE AND REVIEW OF THE LITERATURE

The condition occurs with comparative rarity, as Still [8] found it only once in a total of forty-four cases of cardiac malformations which he analyzed. The earliest description was given by Matthew Baillie [9] in 1797, who reported a case in a 2 months old infant, livid and cold during life, but showing no symptom of dyspnea. The great cardiac vessels were transposed, the ductus arteriosus was sufficiently large to admit a crow-quill, and the foramen ovale was a little more closed than in a new-born infant. Farre,[10] who wrote one of the earliest treatises on congenital heart diseases, reported two cases of his own and quoted an earlier record of the similar defect by Langstaff. Peacock,[11] who was perhaps the most enthusiastic student of the subject, collected seventeen cases, although the data indicate that up to the time of his writing, there had been fully twice as many cases on record. Cockle,[12] in 1863, analyzed forty-two cases of transposition, including the two cases of Meckel, occurring in a lamb and a calf. Kelley [13] spoke of forty cases reported up to 1871, while Rauchfuss [14] mentioned

8. Still, G. F.: Common Disorders and Diseases of Childhood, ed. 3, New York, Oxford University Press, 1920.

9. Baillie, M. E.: Morbid Anatomy, ed. 2, 1797, p. 38.

10. Farre, J. R.: On Malformations of the Human Heart, 1814, p. 28.

11. Peacock, T. B.: On Malformations of the Human Heart, London, 1858 and 1866.

12. Cockle, J.: Transposition of the Great Vessels of the Heart, Med.-Chir. Tr. **46**:193, 1863.

13. Kelley, C.: Transposition of the Great Vessels; Cyanosis, Tr. Path. Soc., London **22**:92, 1871.

14. Rauchfuss, C.: Die angeborenen Entwickelungsfehler und die Fötalkrankheiten des Herzens und der grossen Gefässe, Gerhardt's Handb. f. Kinderkrankheiten, Tübingen **4**:107, 1878.

twenty-five cases, including three of his own. Thérémin [15] found twenty-six cases of transposition among 106 cases of cardiac defect revealed at autopsy in the St. Petersburgh Foundling Hospital, which is the highest percentage of occurrence ever reported. Vierordt [16] was able to find seventy-six cases among 383 cases of cardiac anomalies which were analyzed. Keith [17] examined 270 cases of cardiac defect in the London Museums and found transposition occurring in twenty-five. Bokay [18] analyzed thirty-four cases, including one of his own, in his article published in 1911. The most recent and complete tabulation of data is given by Abbott who referred to forty-four cases of this anomaly in the first edition of Osler's Modern Medicine (1912), but this figure is revised in the third edition (1927) to eighty-eight. This revised figure, however, includes twenty-five cases of partial transposition and five cases of corrected transposition, so that the total for complete transposition is only fifty-eight.

From the analyses by previous workers on this subject, and by exploring the field of cardiac pathology, I have collected a total of ninety-two cases of complete transposition as recorded in the literature. It must be added that I claim no absolute completeness, for some of the references taken from other writers have not been confirmed, due to nonavailability of original sources. The five cases reported in the present paper bring the total up to ninety-seven cases of transpositio vera. In table 1, the ninety-two reported cases are tabulated in their chronological order. The references that have not been confirmed are given under the authority of the writers from whom they were taken.

REPORT OF CASES

It is of some interest to note from the standpoint of incidence, that of the five cases here reported, two happened to come, one immediately following the other, to the autopsy table within a short period of four days in 1923, while the other three were seen during the year 1929. In the long history of the hospital no other similar cases were recorded in other years.

CASE 1.—*History.*—T. D., a white boy, Polish, born Nov. 12, 1922, was admitted to the hospital on Oct. 10, 1923, with a complaint of diarrhea and persistent cyanosis. The patient was blue at birth and seemed to be getting worse. The intestinal condition cleared up in about four days after admission, but there was an increasing difficulty in respiration and other symptoms referable to cardiac deformity.

15. Thérémin: Études sur les affections congénitales du coeur, Paris, 1895.
16. Vierordt: Nothnagel's Specielle Pathologie und Therapie, 1898.
17. Keith, A.: Lancet **2**:435, 1909.
18. Bokay, Zoltan von: Ueber Transposition der grossen Schlagadern des Herzens, Arch. f. Kinderh. **55**:321, 1911.

TABLE 1.—*Chronological List of Reports on Transposition (Ninety-Two Cases)*

	Author and Source	No. of Cases	Sex	Age	Pathology*
1	Baillie, M.: Morbid Anatomy, 1797, p. 33....	1	..	2 months	D.A. passable; F.O. open
2	Langstaff, G.: London Med. Rev. **4**: 88, 1811	1	..	10 weeks	F.O. closed; D.A. normal width; P.A. branch of descending aorta
3	Farre, J. R.: On Malformations of the Human Heart, 1814, p. 28	2	..	5 months	F.O. slightly closed; D.A. contracted
3-A	.....		..	79 hours	F.O. open; D.A. open; V.S. absent
4	Wistar, C.: A System of Anatomy, 1814, vol. 2, p. 75	1	M	2.5 years	F.O. open; V.S. and D.A. closed
5	Gamage, W.: New England J. M. & S. **4**: 244, 1815	1	F	15 weeks	F.O. widely open; D.A. not found
6	Nasse, C. F.: Leichenöffnungen, Zur Diag. u. path. Anat., Bonn, 1821	1	..	19 years	F.O. and V S open; P.A. contracted
7	Müller: Horn's Arch., 1822, cited by J. Cockle	1	..	1 year	V.S. open
8	Tiedemann: Ztschr. f. Physiol., Heidelb. **1**: 111, 1824	1	..	12 days	F.O. and D.A. widely open
9	d'Alton: De cyanopathiae speciae, etc., Bonn, 1824, cited by H. Meyer	1	F	22 months	F.O. open; V.S. and D.A. closed
10	Burkart: De monst. notan., Freiburg, 1825, cited by J. Cockle	1	..	.....	No data given
11	Duges: J. gén. de méd. **101**: 88, 1827.....	1	..	5 days	D.A. patent
12	Behre: Mitt. a. d. Geb. d. ges. Heilk., Hamb. **1**: 212, 1830	1	..	.....	V.S. open
13	Blumhardt: Mitt. d. Würtenb. aerzt. Ver. **1**: 193, 1833-1834	1	..	New-born	V.S. defect
14	Coligny, cited by Cockle, Arch. gén. d. méd. **5**: 284, 1834	1	M	2 years, 7 months	F.O. nearly closed
15	Ducrest, cited by Cockle, Arch. gén. d. méd. **9**: 76, 1840	1	F	10 hours	F.O. and D.A. patent
16	Stedman: Lancet **1**: 645, 1841-1842.....	1	F	7 months, 8 days	F.O. and V.S. open; D.A. closed
17	Walshe: Med.-chir. Tr. **25**: 1, 1842.....	1	M	10 months	F.O. and D.A. open; V.S. normal
18	Thore: Arch. gén. d. méd. **15**: 316, 1812....	1	..	11 days	F.O. open; V.S. rudiment
19	King, T. W.: Monthly J. M. Sc., Lond. **4**: 32, 1844	1	..	2 years, 9 months	F.O. and V.S. open; D.A. closed
20	Friedberg, H.: Die angeb. Krankheiten des Herzens, Leipzig, 1844, p. 92 (1) Case of Bock, cited by Cockle.....	1	..	8 months	V.S. and D.A. open
21	(2) Case of Mauran, J.: Phila. J. M. & Phys. Sc. **14**: 253, 1827	1	..	7 months, 8 days	V.S. and F.O. open; D.A. closed; P.A. atresic at origin
22	(3) Case of Raoul-Chassinat, cited by Cockle	1	..	12 days	V.S. and D.A. open
23	(4) Case of Hasse, cited by Cockle.....	1	..	.....	Prob. def. aur. and vent.
24	Back, B.: Arch. f. physiol. Heilk. **5**: 288, 1846	1	F	75 hours	F.O. and D.A. open; V.S. normal
25	Chevers, N.: Tr. Path. Soc., Lond. **1**: 55, 1846-1848	1	..	8 hours	D.A. widely open
26	Johnson, C. P.: Am. J. M. Sc. **46**: 370, 1850	1	M	2 months	D.A. and F.O. open
27	Stoltz, J. A.: Mém. soc. d. med. d. Strasb. **2**: 89, 1850-1854	2	M	5 days	F.O. and D.A. patent; V.S. intact
27-A	.....		F	36 days	F.O. open
28	Ward, O.: Tr. Path. Soc., Lond. **1**: 55, 1846-1848	1	..	2 months, 9 days	D.A. patent
29	Peacock, T. B.: Tr. Path. Soc., Lond. **6**: 117, 1854	1	..	8 months	F.O. closed; D.A. probably open
30	Keil: Beschreibung eines Falles von Transposition des Ursprunges der beiden grossen Körperarterien, Würzburg Diss., 1854	1	..	35 hours	F.O. and D.A. open; V.S. complete
31	Ribes, cited by Pize: Consideration sur les anomalies cardiovasculaire et vasculaire, Thèse, 1854	1	..	3 years	F.O. open
32	Bednar, cited by Bokay: Die Krankheiten der Neugeborenen und Säuglingen, 1850-1852	3	M	17 days	F.O. and D.A. open
32-A	.....		M	32 days	F.O. and D.A. patent
32-B	.....		F	17 days	F.O. and D.A. open
33	Buchanan, G.: Tr. Path. Soc., Lond. **8**: 149, 1857	1	M	4 years	F.O. and V.S. open; D.A. closed; dextroposition of aorta

* Abbreviations indicate: F.O., foramen ovale; D.A., ductus arteriosus; V.S., interventricular septum; P.A., pulmonary artery; D.C., duct of Cuvier; R.V., right ventricle; L.V., left ventricle and R.A., right auricle.

TABLE 1.—*Chronological List of Reports on Transposition (Ninety-Two Cases)—Continued*

	Author and Source	No. of Cases	Sex	Age	Pathology*
34	Meyer, H.: Virchows Arch. f. path. Anat. **12**: 364, 1857	1	..	1 month	F.O. and D.A. patent; V.S. complete
35	Schilling, E.: New York M. J. **3**: 71, 1857...	1	M	15 months	F.O. open; V.S. contains a cordiform slit
36	Peacock, T. B.: Malformations of the Human Heart, 1858 and 1866	3			
	(1) Case of Boyer.....		..	2 months	F.O. open; D.A. closed in part
37	(2) Case of Worthington.....		..	.....	
38	(3) Case of Hess.....		M	8 months	F.O. closed; D.A. open
39	Martin: Müller's Arch, 1859, cited by Cockle	1	..	10 weeks	Doubtful cor biloculare
40	Cockle, J.: Med.-Chir. Tr., Lond. **46**: 193, 1863	1	M	2.3 years	F.O. open; V.S. and D.A. closed; thymus and spleen large
41	Otto, cited by Cockle: Seltene Beobachtungen	1	..	7 months' fetus	F.O. open; V.S. and D.A. absent
42	Brechet, G., cited by Cockle: Memoire sur un vice de conformation congenital des enveloppes du coeur, Paris, 1826	1	..	.....	F.O. open; V.S. absent; D.A. abnormal
43	Lawrence, cited by Cockle.....	1	..	.....	F.O. open; V.S. absent; P.A. contracted
44	Kreysig, cited by Cockle: Krankheiten des Herzens	1	..	.....	F.O. closed; P.A. branch of descending aorta
45	Meigh, J. F.: Proc. Path. Sos., Phila. **2**: 37, 1860-1866	1	M	44 days	F.O. and D.A. open
46	Fränkel: Berl. klin. Wehnschr. **7**: 24, 1870	1	..	7 weeks	F.O. and D.A. open; V.S. closed
47	Kelly, C.: Tr. Path. Soc., Lond. **22**: 92, 1871	1	..	2 months	F.O. open; D.A. closed
48	Rauchfuss, C.: Gerhhardt's Handbuch für Kinderkrankheiten **4**: 107, 1871	1	..	.....	F.O. and D.A. patent
49	Pye-Smith, P. H.: Tr. Path. Soc., Lond. **23**: 80, 1872	1	..	5 weeks	F.O. and D.A. open
50	Ogston, A.: Oesterr. Jahrb. f. Paediat. (Wien) **4**: 169, 1873	1	M	96 days	D.A. patent
51	Rokitansky, C.: Die Defekte der Scheidenwände des Herzens, Wien, 1875	1	..	.....	F.O. slightly open; D.A. closed
52	Janeway, E. G.: M. Rec. **12**: 811, 1877.....	1	M	22 months	F.O. and V.S. open; D.A. slightly patent
53	Lees, D. B.: Tr. Path. Soc., Lond. **31**: 58, 1880-1881	1	M	7 months	F.O. closed; D.A. patent; V.S. defect
54	Scott, J. H.: J. Anat. & Physiol. **82**: 302, 1881	1	..	.....	F.O. and D.A. open; V.S. defect (2 to 3 mm.)
55	Ashby, H.: J. Anat. & Physiol., Lond. **16**: 90, 1881	1	F	7.5 months	F.O. open; D.A. closed; V.S. defect
56	Holl, M.: Med. Jahrb., Wien, 1882, p. 503...	1	..	71 days	F.O. and D.A. patent
57	Etlinger, N. E.: Med. Vestnik (St. Petersburg) **21**: 329, 1882; Berl. klin. Wehnschr. **1**: 399, 1882	1	M	6 months	F.O. and D.A. open; V.S. defect; P.V. terminater in R.A.
58	Gampert, A.: Bull. Soc. Anat. de Par. **44**: 604, 1889	1	..	8 months	D.A. closed; V.S. defect
59	Doring, J.: Arch. Pediat. **7**: 741, 1890.....	1	M	10 years	F.O. patent
60	Osler, W.: Cyclop. Dis. Child. **2**: 760, 1891..	1	..	8 months (Prem.)	F.O. open; V.S. small opening
61	Hochsinger, C.: Wien. Klin. **17**: 47, 1891....	1	..	5 weeks	F.O. and D.A. closed; V.S. defect
62	Sanders, G.: A. Anat. & Physiol., Lond. **27**: 464, 1892-1893	1	..	7 months	D.A. open; F.O. closed; V.S. defect
63	Theremin, Emile: Etuses sur les affections congenitales du coeur, Paris, 1895	1	..	2 days	D.A. open; F.O. and V.S. closed
64	Rolleston, H. D.: Pediatrics, N. Y. **4**: 108, 1897	1	F	2 weeks	F.O. fenestrated; D.A. closed; V.S. defect
65	Rheiner, G.: Arch. f. path. Anat. etc. **146**: 540, 1896	1	F	8 months	D.A. open; F.O. patent; V.S. defect; P.A. stenosis

* Abbreviations indicate: F.O., foramen ovale; D.A., ductus arteriosus; V.S., interventricular septum; P.A., pulmonary artery; D.C., duct of Cuvier; R.V., right ventricle; L.V., left ventricle and R.A., right auricle.

TABLE 1.—*Chronological List of Reports on Transposition (Ninety-Two Cases)—Continued*

	Author and Source	No. of Cases	Sex	Age	Pathology*
66	Rolly: Jahrb. f. Kinderh. **50**: 241, 1899.....	1	M	8 months	F.O. patent; V.S. defect
67	Simmonds: Deutsche med. Wchnschr. **26**: 81, 1900	1	M	.....	D.A. open
68	Apert, E., and Brezard: Bull. et mém. Soc. anat. de Paris **80**: 652, 1906	1	..	3 months	D.A. and F.O. closed; V.S. defect
69	Scheele, cited by M. Peiser: Ueber angeborene Herzfehler, Diss., Greifswald, 1909	1	..	4 months	D.A. and F.O. open
70	Bournier: Bull. et mém. Soc. anat. de Paris, 1907	1	M	24 days	P.A. atresic; V.S. defect; D.A. patent
71	Cautley, E.: Proc. Roy. Soc. Med., Lond. **2**: 162, 1908-1909	1	..	11 months	F.O. open; D.A. closed; V.S. defect
72	Bönninger, M.: Deutsche Med. Wchnschr **34**: 129, 1908	1	..	2 months	F.O. and D.A. open
73	Otto, Wenner: Virchows Arch. f. path. Anat. **196**: 127, 1909	1	M	1 year	F.O. and D.A. closed; V.S. defect
74	Entz: Budapest. Orvosi Ujsag, 1910, p. 947, cited by Bokay	2	M	3 months	F.O. and D.A. open
74-A	.....		M	3.5 months	F.O. open; D.A. closed; V.S. defect; D.C. open
75	Bokay, Z. von: Arch. f. Kinderh. **55**: 321, 1911	1	M	10 months	F.O. open; D.A. and V.S. closed
76	Sedillot: Bull. Soc. de pédiat. de Paris **14**: 326, 1912	1	M	37 days	D.A. permeable; F.O. open; V.S. normal
77	Bissell, W. W.: Tr. Clin. Path. Soc. **9**: 102, 1914	1	M	11 days	V.S. absent; R.V. atresic
78	Gilliat, W.: J. Anat. & Physiol. **50**: 10, 1915	1	..	3 days	F.O. and D.A. open; L.V. atrophied; V.S. normal
79	Hedinger, S.: Centralbl. f. allg. Path. u. path. Anat. **26**: 529, 1915	1	F	56 years	V.S. defect; D.A. closed; F.O. partially open
80	Marchand, cited by Hedinger.....	1	M	21 years	R.V. rudimentary; V.S. absent; F.O. and D.A. closed
81	Lewis, F. T., and Abbott, M.: Anat. Rec. **9**: 103, 1915	1	M	21 years	V.S. rudimentary
82	Robertson, J. J.: Heart **6**: 99, 1915-1917....	1	M	7 months (Prem.)	V.S. defect; P.A. stenosis
83	Jacobson, V. C.: Am. J. Dis. Child. **21**: 176, 1921	2	M	12 months	F.O. and V.S. patent
83-A	.....		M	3 weeks	D.A. open; F.O. slightly open
84	Abbott, M., and Dawson, W. T.: Intern. Clin. **4**: 181, 1924	1	..	7 days	D.A. patent; atresia of aortic orifice
85	Dreyfuss, M.: Proc. N. Y. Path. Soc. **25**: 114, 1925	1	..	6 days	D.A. wide open; F.O. patent; V.S. small defect
86	Ball, R. P.: Am. J. Dis. Child. **32**: 84, 1926	1	..	2.5 years	D.A. closed; V.S. absent

* Abbreviations indicate: F.O., foramen ovale; D.A., ductus arteriosus; V.S., interventricular septum; P.A., pulmonary artery; D.C., duct of Cuvier; R.V., right ventricle; L.V., left ventricle and R.A., right auricle.

The child was a full term infant of normal birth, who had been blue since birth; he was breast fed for seven months. Bowel movements were normal at that time. Both parents were living and well, with three other children; there was no history of miscarriage.

Physical examination on admission revealed an acutely ill infant who was extremely blue all over the body, but of good nutrition; the child was irritable. He was not dehydrated. Respiration seemed about normal in rate, and there was an occasional short dry cough, especially on crying. The veins of the scalp were prominent, and the anterior fontanel was open and slightly depressed. The eyes showed a slight degree of strabismus, but the pupils reacted to light and were equal on both sides. The ear drums were moderately congested, but no bulging was seen. There was no nasal discharge. The mucous membrane of the mouth in general was cyanotic. The pharynx was injected. The chest was narrow and bulging but practically symmetrical. The lungs were resonant throughout with no abnormal breath sounds. The apical beat of the heart was

in the fifth interspace. The left border of the heart was about 1 inch outside the left nipple line, while the right seemed to lie beyond the right edge of the sternum. The rhythm was regular and the tones were loud. There was a systolic murmur and also a soft diastolic; both were best heard at the apex and appeared to be transmitted to the left axilla. The pulmonic second sound was decreased in intensity. The abdomen was rather tense, but no tenderness was elicited. The border of the liver was palpated about two fingerbreaths below the costal margin on the right side. The spleen was not palpated. No other masses were felt. The genitals were those of a normal boy. The diaper region was reddened. The extremities were normal in every respect, and the reflexes were unchanged.

October 11, 1923: The patient was seen by Dr. Brennemann who noted a double murmur in the apical region, with suppression of the pulmonic second sound. Examination of the blood on this day showed hemoglobin 100 per cent plus, white blood cells 6,000 and red blood cells 5,960,000. The differential count revealed 27 per cent polymorphonuclears, 23 per cent large and 50 per cent small lymphocytes. The throat and nasal cultures were negative for diphtheria bacilli. The urine was clear, acid in reaction and contained no albumin, no blood cells and no casts.

October 15, 1923: The infant was examined by Dr. Bachman who made the following notations: "Distinct cyanosis evident over entire body. The heart borders rather difficult to percuss, but the left border seems just outside the nipple line and the right at the sternal margin. There is a short rough palpable thrill over the apical region and a loud blowing systolic murmur can be heard over the entire praecordium but with maximal intensity in the apical region. It can be heard well in the vessels of the neck and faintly in the back. The second pulmonic can be heard but is not accentuated. The second sound at the apex is also faint."

October 13: Clotting time of the blood was six minutes and bleeding time was prolonged. The Wassermann test on the blood and the Pirquet test were both negative.

October 26: Slight edema of the lower extremities was noted. The stools were normal.

November 18: The red blood cells numbered 5,600,000.

November 19: The child took the bottle well at 9 a. m., and at 9:45 a. m. was found dead.

Roentgenologic examination was made on Oct. 16, which revealed a distinctly globular outline of the heart, with the left border almost touching the left thoracic wall. The shadows and hilum markings of the lungs appeared fairly normal.

Autopsy.—As the sternum was removed, yellowish fluid exuded from the right pleural cavity, while the left was free. The greatest transverse diameter of the heart at the apex was 9 cm., and the greatest vertical diameter was 7 cm. The pericardial sac contained about 10 cc. of clear straw-colored fluid. The myocardium was dark blue. The coronary veins were distended with dark blood, while the coronary arteries were empty. The right auricle was distended with blood. The adventitia of the aorta, the pulmonary artery and the right ventricle were covered with petechial hemorrhages. The right ventricle was opened with the usual incision, starting at the apex. The scissors traveled along the great vessel, which was continuous with the arch of aorta, where the following branches were given off: (1) the short innominate artery, which was divided into the right subclavian and the right common carotid artery, (2) the left common carotid artery and (3) the left subclavian artery. The remaining portion of the descending aorta, both thoracic and abdominal, showed no other abnormalities. The

papillary muscles of the right chamber were greatly hypertrophied. The wall of the chamber was 1 cm. thick at its thickest portion. The cusps, three in number, were unchanged. Just above the posterior cusp of the vessel there was an opening continuous with the posterior coronary artery. Just above the septal or medial cusp, there was a similar opening which led to the anterior coronary artery. The left ventricle was opened in the usual manner and was found to be continuous with a greatly dilated vessel with three cusps, the left of which had an enlarged corpus arantiae measuring about 2.5 mm. in diameter. Just below the septal cusp there was an opening about 7 mm. in diameter, though which the left and right ventricles were in communication. There were two branches of this vessel, which were identified as the right and left pulmonary arteries, the apertures being 12 mm. above the junction of the septal and posterior cusps. This vessel was in

Fig. 1.—Photograph of heart and lungs in case 1.

direct communication with the thoracic arch of the aorta on its concave side, which was the widely patent ductus arteriosus. The mitral valve leaflets which guard the orifice to the small stump like left auricle which receives the right and left pulmonary veins were grossly unchanged. The septum at its thickest part measured 2 cm. The lower portion of the foramen ovale was patent, the upper portion being closed by adhesions.

Figure 1 is a reproduction of a photograph of the heart and the lungs in case 1, the specimen being preserved in the pathologic museum of the hospital. The right and the left ventricles are open, and the aorta, which is seen to arise from the right ventricle, and the pulmonary artery arising from the left, as well as the dilated ductus

arteriosus, are all open along the anterior surface. A glass rod is seen protruding through the defect in the interventricular septum, which is situated just at the junction of the muscular portion below and the membranous portion above. In order to enhance the clearness of the interpretation of the photograph, a pen and ink diagram of the photograph with explanatory remarks is appended (fig. 2).

CASE 2.—*History.*—R. W., a white boy, American, born Sept. 21, 1923, was admitted to the hospital on Nov. 21, 1923, with the complaint that it had been blue since birth. The infant had been becoming more cyanotic for the past two weeks. The mother stated that whenever the baby cried, it became more blue. On the morning of admission, the baby had a "spell" and turned pale. The parents were well, and this was the only child; no other pregnancies were noted. The baby had been a bottle-fed infant since birth.

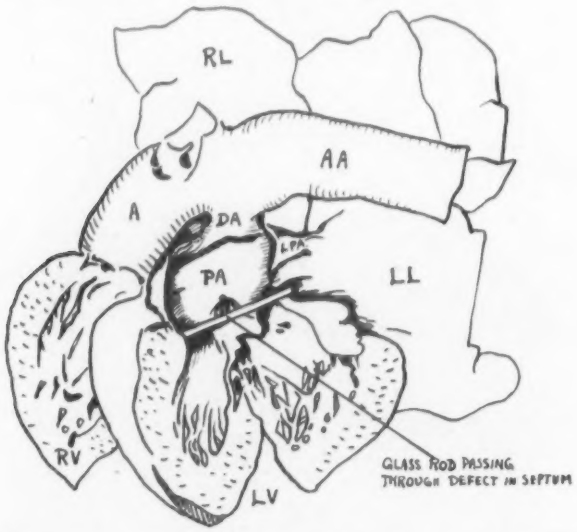

Fig. 2.—Diagram of photograph shown in figure 1. *RL* indicates right lung; *RV*, right ventricle; *A*, aorta; *AA*, arch of aorta; *PA*, pulmonary artery; *DA*, ductus arteriosus; *LPA*, left pulmonary artery; *LL*, left lung, and *LV*, left ventricle.

Physical examination on admission revealed a moderately well nourished and normally developed male infant, with generalized cyanosis, particularly noticeable in the fingers and toes. The anetrior fontanel was normally open, with no increased tension. The buccal mucous membrane was not inflamed, and the pharynx was normal. The left side of the chest seemed to be larger than the right, but expansion was full and equal on both sides. There was a visible pulsation over the entire epigastrium. No thrill was felt. The heart showed a loud, rough, prolonged murmur, systolic in time, which was heard all over the precordium and transmitted to the back and axilla. The lungs were normal. The abdomen was sunken and relaxed, and showed no masses or tenderness. The external genitalia, the extremities and the reflexes were all normal.

"Since the admission the patient had had several cyanotic spells. Oxygen inhalation was tried with no benefit. Red blood cells numbered 5,380,000 on November 22, but hemoglobin was so high that it was impossible to estimate it." The notation made by the resident physician reads: "Child markedly cyanotic. The heart is enlarged both to right and left. The apex beat felt and apex percussed outside nipple line in the fifth interspace. There is heard a slightly suggestive bronchial breathing over lower and lateral heart area. The first sound is rather blurred and there is a rather rough systolic murmur at the apex and heard even more clearly over remainder of the precordium. The murmur is transmitted

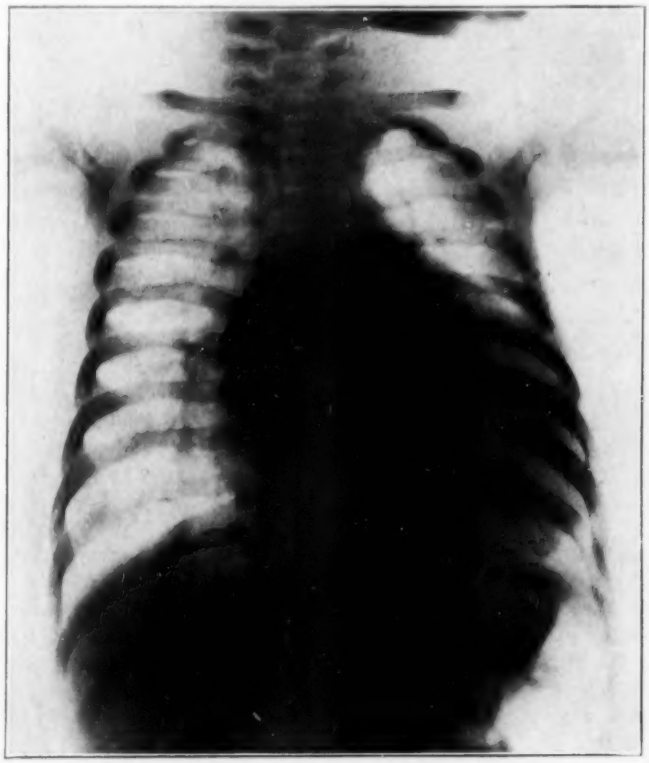

Fig. 3.—Roentgenogram of chest in case 1.

to axilla and back. The second pulmonic is not accentuated but feeble. There is a definite low-pitched, rumble-like murmur transmitted to the vessels of the neck. No definite thrill could be palpated."

Nov. 22, 1923: The patient died at 12:35 p. m.

Autopsy.—The transverse diameter of the pericardial sac was larger than normal, and contained a few cubic centimeters of clear, straw-colored fluid. The right ventricle and auricle were distended with dark, clotted blood. The vessel leading from the right ventricle was somewhat dilated and was continuous with the arch of the aorta at which point the following branches were given off: (1) large innominate artery, (2) the left common carotid artery, (3) the left subclavian artery and (4) a small unidentified artery. The valves at the outlet of

the right ventricle were three in number and were normal in size. There was a small orifice behind the posterior cusp of this vessel, which opened into the posterior coronary artery. The tricuspid leaflets were unchanged. The papillary muscles were prominent in the right chamber. The left ventricle contained a small amount of loosely clotted blood, from which a large dilated artery emerged and terminated as the right pulmonary artery, the left pulmonary artery and chordlike ductus arteriosus which was patent anatomically but closed functionally, admitting the passage of only a fine probe. There were three cusps situated at the beginning of this vessel; they were decidedly thickened, resembling vegetations. The right and left cusps were small, while the posterior cusp was wide. The leaflets of the mitral valve were unchanged. The left auricle was normal in size and received the right and left pulmonary veins. There was no defect in the interventricular septum. The foramen ovale was closed by a thin membrane with several small fenestrae.

Figure 4 is a reproduction of the photograph of the heart and lungs in case 2, showing the two ventricles opened in the customary manner. The large aorta is seen emerging from the right chamber, and the several openings into its branches are seen. The pulmonary artery arises from the left ventricle and is short and dilated. The ductus arteriosus is a chordlike connection between these two vessels. A glass rod passes through the right pulmonary artery into the right lung. A pen and ink diagram is also shown (fig. 5).

CASE 3.—*History.*—D. Di G., a white girl, Italian, born Jan. 8, 1929, was admitted to the hospital on Feb. 16, 1929, when 5 weeks old with a history that the mother had found the baby cyanotic and gasping for breath on the morning of admission. The child was a full term baby of normal birth, with no record of birth weight. There apparently had been no convulsions or previous cyanotic spells.

On examination, a tiny, female infant, cyanotic, with grunting respirations was seen; the child was almost in a dying condition. The temperature was 97 F. The chest expansion was poor. There was an expiratory grunt and increased breath tones in the left upper and left lower lobes posteriorly. The heart rate was slow but regular. At the time of admission, impression was that the infant had pneumonia and possibly a large thymus and an intracranial hemorrhage. Immediately on admission, the child received an injection of alpha lobelin, 0.25 grain, and oxygen was administered. A noticeable improvement in respiration followed and a satisfactory change in color. The baby was then placed in the tent for premature infants and fed water with a nasal catheter. Five hours later, the child became blue and had frequent attacks of dyspnea and cardiac embarrassment. The patient died on Feb. 17, 1929.

Autopsy.—The apex of the heart consisted entirely of a left ventricle. The superior and inferior vena cava normally entered into the right auricle of the heart. Blood was shunted into the right ventricle, which it left by way of the aorta. This artery was in the place usually occupied by the pulmonary artery. It was definitely the aorta in that there were two coronary arteries present normally at its base, and the arch normally bifurcated into the normal great vessels of the neck and then continued down to be the thoracic aorta. Just beneath the aorta, there was a hole about 1 cm. in diameter which was in the septum, so that there was a continuous passage between the right and the left ventricles. The blood entered the left auricle of the heart normally from the

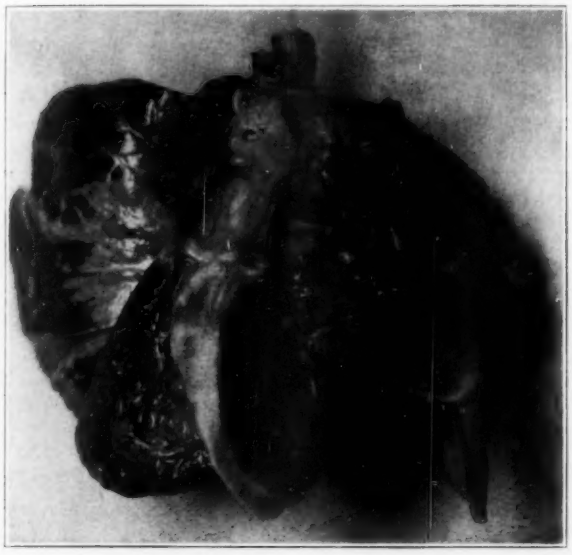

Fig. 4.—Photograph of heart and lungs in case 2.

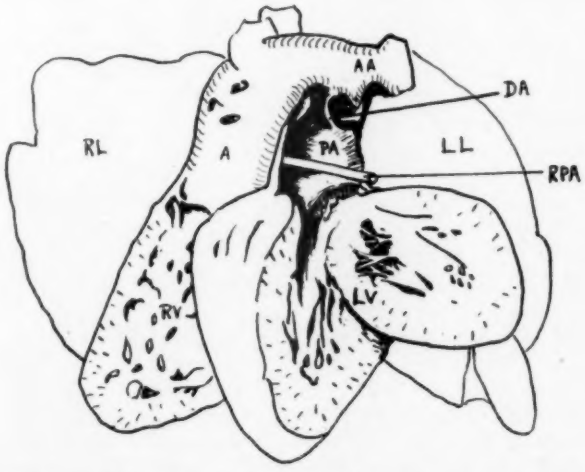

Fig. 5.—Diagram of photograph shown in figure 4. *RL* indicates right lung; *RV*, right ventricle; *A*, aorta; *AA*, arch of aorta; *PA*, pulmonary artery; *DA*, ductus arteriosus; *RPA*, glass rod passing through right pulmonary artery; *LV*, left ventricle, and *LL*, left lung.

lungs and was discharged into the left ventricle, normally passed the mitral leaflets and from thence into a dilated structure which bifurcated normally to both lungs; that is, it was the pulmonary artery. Between dilated structures which were a pulmonary artery and a dilated aorta, there was a delicate passage about 1.5 mm. in diameter which was continuous to the descending thoracic portion of the aorta; that is, it was a persistently patent ductus arteriosus. The foramen ovale was functionally closed, but normally anatomically patent. The probable course of the circulating blood in this heart, then was that it normally entered the right auricle, from whence it passed to the right ventricle and then out into the arterial system. Some blood, however, entered the left ventricle of the heart through the persistently patent interventricular septum. Blood entering the left auricle normally passed into the left ventricle and returned to the lungs again by way of the dilated pulmonary artery. Thus arterial blood in the left ventricle of the heart entered the arterial system apparently by way of the opening in the interventricular septum, passing into the right ventricle and then to the aorta which was located in the position usually occupied by the pulmonary artery; venous blood presumably entered the left side of the heart by the same method. Presumably then, there was a to-and-fro motion to mix properly the arterial and venous blood. This heart corresponded almost identically to that in case 1.

CASE 4.—*History.*—R. T., a colored boy, born Feb. 20, 1929, was brought to the hospital on March 12, 1929, when 3 weeks old. The child had not been well since birth. It often regurgitated its food, and during the night before admission had a period of marked cyanosis, according to the mother. The child became cold. A visiting nurse had been applying external heat to this baby ever since it was born, and the temperature had been subnormal most of the time. The child coughed only occasionally, and the umbilical cord scar had healed only three days before admission. The last twenty-four hours before admission, the child had practically not eaten. Birth was normal and rapid; the weight at birth was 6 pounds (2721.5 Gm.) though the infant was born at full term. The child was blue the first two days, which was noted especially on the lips. There were no convulsions until the present illness. The infant lay exposed in bed one hour after birth before the physician arrived. It had been breast fed for two weeks and then had been on a supplementary formula.

At the time of admission, the physical examination revealed a poorly nourished and listless colored child who did not appear to be acutely ill. The anterior fontanel was widely patent. As the eyelids were tightly closed, no pupillary reflexes were seen. There were no snuffles. The tongue was clean, and the throat was normal. The chest was well formed. In the lungs there were tubular breathing in the region of the right scapula and some râles, but no dulness anywhere. In the heart, there was a murmur at the base and at the apex. The skin turgor was poor. The margin of the liver was from 1 to 2 cm. below the costal edge, and the spleen was not felt. Knee reflexes were present. One plus Kernig sign was bilaterally present, but the Brudzinski sign was negative. The lower extremities were spastic. The impression at the time of admission was that the infant was suffering from malnutrition, possible early Little's disease, congenital heart disease and probable active intracranial hemorrhage and finally a possible thymus. The hemoglobin was 90 per cent, the red cells 4,800,000 and the white cells 18,000, of which 38 per cent were polymorphonuclears, 44 per cent large lymphocytes and 18 per cent small lymphocytes. The Pirquet test was negative. Death, which occurred on March 13, 1929, sixteen hours after admission, was sudden.

In the family history there was no real history of syphilis. The patient was the seventh child, and only two other children were living and apparently well. Two had died of convulsions at 1 and 22 months of age, respectively; one was premature, and one died of pneumonia.

Autopsy.—The heart was evidently from two to two and one-half times the usual size. The apex consisted entirely of the right ventricle. Before the heart was cut into, it was evident that the aorta came off from the right ventricle and the pulmonary artery from the left. Both of them were about of uniform caliber, and about the usual size for each. The heart was cut into in the usual way on each side of the interventricular septum. Nowhere was there any defect in the interventricular septum. The blood entered the right auricle normally from the superior and inferior vena cava, passed into the right ventricle and directly out from the right ventricle by way of what was the aorta, and at its base there were the two openings of the coronary arteries. This aorta branched normally into the great vessels of the neck and continued normally down to become the thoracic and abdominal aorta. Blood entered the left auricle of the heart normally from the lungs, flowed past the mitral leaflets into the left ventricle and out into the pulmonary artery, which extends along both sides to the lungs. From the pulmonary artery proper to the aorta was a persistently patent ductus arteriosus which on the aortic side was 3 mm. in diameter and on the pulmonic side 2 mm. Across the foramen ovale was the normal leaf, but as this was gently raised, it left a hole which was at least from 6 to 8 mm. in general diameter. The circulation in the heart, then, was as follows: The blood entered both auricles normally and flowed into both ventricles normally, but from the right ventricle venous blood passed directly into the arterial tree, and the aerated blood in the right auricle flowed back again into the lungs and into the arterial system only by crossing the patent foramen ovale or through the rather small patent ductus arteriosus.

CASE 5.—*History.*—LeR. G., a white boy, born Sept. 10, 1929, was brought to the hospital on Sept. 22, 1929, because of convulsions and diarrhea. The child was born three weeks before term after an apparently normal but rapid delivery. He was well until September 21, when convulsions began. Each convulsion was preceded by a thin, greenish, watery stool.

On examination, the infant was markedly cyanotic but not dyspneic. The pulse was rapid, of poor quality but regular in rhythm . The anterior fontanel was bulging but not tense. The abdomen was not distended, but was soft and doughy. The temperature was 96 F. The child was fed on protein milk and barley water. His bleeding time was five minutes and ten seconds. Thirty cubic centimeters of whole blood was given intramuscularly, and the child was placed in the oxygen tent. Slight convulsions continued, for which chloral and bromides were given. Cyanosis continued. At times the infant was dyspneic. The spinal fluid was under slightly increased pressure, contained 38 cells and gave a positive globulin reaction. Signs of consolidation of the right lung developed. No heart murmurs could be detected. Various stimulants were used, but respirations became labored, and the child died during one of the attacks of cyanosis.

Autopsy.—The pericardium occupied a rather central position. It contained practically no free fluid. Both surfaces of the pericardium were smooth and glistening, but the heart itself seemed reddish violet. The right auricle was markedly distended with a soft, dark red thrombus. The right ventricle contained only a small blood clot and was flabby. The other heart chambers contained dark red thrombi and fluid blood. There were no deformities or abnormalities of the valves, and the endocardium was everywhere smooth and

glistening. The aorta took its origin from the right ventricle, the pulmonary artery from the left ventricle. On the concave aspect of the ascending portion of the aortic arch, there was a communicating vessel between the aorta and the pulmonary artery. This vessel measured 6 mm. in circumference. There were no points of constriction, and no thrombi of either of the great vessels. The foramen ovale was anatomically open, 4 mm. in diameter, and functionally open by a small cleft about 4 mm. in length. There were no other defects in the heart.[19]

TABLE 2.—*Summary of Clinical and Pathologic Observations in Five Cases*

Case	Age at Death; Race; Sex	Ductus Arteriosis	Foramen Ovale	Interventricular Septum	Cardiac Vessels	Size of Heart	Cyanosis	Murmurs	Pulmonic Second Sound	Observations on Blood
1	7 days Polish Male	Patent, dilated and short	Lower portion patent	Defect 7 mm. in diameter at pars membranacea	P.A. dilated, aorta normal	Both right left ventricles hypertrophied	Persistent since birth	Systolic and soft diastolic heard at apex	Decreased in intensity	HB: 100% coag. time 6 min.; bleeding time, long
2	60 days White Male	Chordlike, open anatomically but closed functionally	Closed but with several small fenestrae	No defect	P.A. greatly dilated, aorta somewhat dilated	Larger than normal	Blue since birth, increasing last 2 weeks	Systolic heard all over precordium	Feeble	HB. so high that it could not be estimated
3	40 days Italian Female	Patent, delicate passage 1.5 mm. in diameter	Functionally closed but anatomically open	Widely patent defect, 1 cm. in general diameter	Both P.A. and A. dilated	Hypertrophy	Cyanotic attacks only 2 days before death	No positive observations noted	Not noted	No notation
4	21 days Colored Male	Patent, 2-3 mm. in diameter	Defect 6-8 mm. in diameter, covered with a leaf	No defect	Normal in size and caliber	2 to 2½ times larger than normal	Cold and ill since birth, with "blue spells"	Murmur at apex and base	Not noted	HB: 90%
5	16 days White Male	Patent, 6 mm. in circumference	Anatomically open, also functionally by a cleft 4 mm. long	No defect	Normal	Right ventricle large	Marked cyanosis	None detected	Not noted	Bleeding time: 5 min., 10 sec.

In table 2 are summarized the more important points in both the clinical and the pathologic observations in the five cases herein reported.

19. All the foregoing specimens of congenital transposition of the great vessels of the heart are preserved in the Pathological Museum of the Children's Memorial Hospital. I had the opportunity of personally examining the patients in cases 1 and 2, first clinically in the infants' ward and later on the autopsy table. The last three cases, though not personally seen by me, are added by the joint courtesies of the chief of staff, Dr. Joseph Brennemann, and the attending pathologist, Dr. William G. Hibbs, to both of whom grateful acknowledgment is herewith made.

SYMPTOMS AND SIGNS

The first and the foremost symptom to be noted is an early, persistent and often extreme cyanosis, consisting of a bluish or purplish discoloration of the skin and mucous membrane, especially noticeable on the lips and finger-nails. In almost all cases, it is present at birth and then it is a congenital cyanosis. If it is not present at birth, it appears shortly afterward, usually in a few minutes after the establishment of respiration. This cyanosis is aggravated by the act of crying or other forms of exertion. It persists throughout life, being constant and continuous in spite of any effort for its relief. Yet the patient is not seen to be suffering from the cyanosis per se, there being a usual appearance of well-being with normal habits of nutrition and defecation, unless associated with other symptoms of deficient oxygenation which will be described presently.

This cyanosis is so constant and striking that many theories have been advanced to explain its pathogenesis. Perhaps the earliest theory is that of de Senac who in his "Traité du Coeur" (1749) ascribed it to admixture of venous with arterial blood through a defect in the interventricular septum, the theory which has found a large number of followers. A rival theory has also been held by Morgagni (1761) which explains cyanosis as being due to venous congestion especially in the peripheral circulation. It was, however, Stille who first showed rather conclusively that cyanosis could occur without the abnormal intermixture of the currents of blood; that there is no proportion between the degree of cyanosis and the amount of venous blood entering the systemic circulation; and that the variations in the extent, depth and duration of cyanosis cannot be explained by a simple intermixture theory.

The more recent researches in biochemistry by Zuntz, Haldane, Krogh, Bancroft, Van Slyke and their colleagues, on the direct estimation of the oxygen and hemoglobin content of the blood, have shed a flood of light on this most fascinating subject. The latest and most complete exposition of experimental determination of the influences directly responsible for cyanosis has been given by Lundsgaard and Van Slyke,[20] and much weight has been attached to their observations by Abbott in explaining congenital cyanosis. These authors regard cyanosis to be produced by "an increase of the reduced hemoglobin up to or above the 'threshold value' of 6.5 volumes per cent of the total hemoglobin in the capillaries," which is expressed in terms of increased oxygen unsaturation.

The next most frequent symptom is dyspnea, which is usually moderate in degree, but at times marked. The respiratory rate may be

20. Lundsgaard, C. R., and Van Slyke, D. D.: Cyanosis, Medicine **2**:1, 1923.

rapid, up to 80 per minute, and always feeble, being superficial and often irregular. This respiratory embarrassment is often exaggerated on emotional excitement such as crying or on voluntary effort such as nursing. Cough sometimes supervenes, and it is usually hoarse. The diagnosis of congenital atelectasis of the lung is often made, and this is frequently confirmed on the autopsy table where imperfect expansion of the lung tissue, especially of the left side, is demonstrated. Occasionally dyspnea is due to accompanying pleurisy or pericarditis. Extreme dyspnea may take on the form of suffocating spells almost similar to the ordinary convulsions of infancy, during which the respiration may cease completely for some length of time, with a rapid pulsation and the heart beating as if in a purring tremor. The child may die while in one of these suffocating attacks, but respiration usually corrects itself in a few minutes, though the child remains decidedly dyspneic.

On physical examination, the presence of a blowing systolic murmur is frequently noted. It is best heard at the base of the heart, in the third intercostal space just to the left of the sternum. It is sometimes heard best over the epigastrium. It is usually not transmitted, but occasionally is heard along the vessels of the neck. This murmur is probably not the murmur directly referable to the transposition itself, but rather to the complicating anomaly of either a defective interventricular septum or a patent ductus arteriosus, for in some cases of true transposition, no murmur can be heard. Some observers record palpating of the cardiac impulse at the left of the ensiform cartilage, and the cardiac impulse at the apex is usually indistinct. In many patients there is a weakening of the pulmonary second sound, although Hochsinger's case showed an accentuation at the base.

Hypertrophy of the right side of the heart is a constant observation. The transverse diameter of the heart is consequently increased, as can be determined by percussion and by a roentgenologic examination.

The pulse rate is also much increased, usually to 135 or more, and may be as high as 170 per minute. There may be an arrhythmia and slightly increased blood pressure.

The blood picture is also suggestive. There is a decided increase in the total red cell count, the phenomenon commonly designated as polycythemia, although a more correct terminology is that suggested by Weber, who called it erythrocytosis. There is little if any change in the white cells. The hemoglobin reading is usually high, being 100 per cent or even higher. Coagulation time is frequently prolonged, probably due to imperfect aeration of the blood. The bleeding time is also increased. There may be epistaxis of an obstinate nature, and occasionally ecchymosis and cerebral hemorrhage. The older writers refer to cases of "exudation of black blood" in these patients, either in the

form of slight hemorrhage from the mucous membrane or in that of petechiae and purpuric maculae or of aphthae (Cockle).

Another interesting group of signs directly due to sluggish circulation in these patients consists of clubbing of the fingertips (Hippocratic fingertips of older writers), edema of the legs and feet, sometimes ascites, and enlargement of the liver and the spleen.

The general nutrition and body growth as well as the mental development are usually undisturbed. The function of the central nervous system is at times active, and unusual intelligence may be demonstrated, but the power of voluntary motion is said to be diminished in many of the cases. With this there may be much weakness of the legs, and actual paralysis of the lower extremities has been observed. The sympathetic nervous system at first functions normally, but gradually there sets in a disturbance of the trophic nerves resulting in increasing emaciation. These subjects are unusually susceptible to infections, especially of the upper respiratory tract, and it is as a rule a respiratory infection that causes death.

Other signs only occasionally mentioned are jaundice, which usually escapes recognition unless pronounced, and cyanosis retinae. But these cannot be discussed here owing to lack of data.

DIFFERENTIAL DIAGNOSIS

The diagnosis of complete transposition of arterial trunks is extremely difficult, as the condition seldom occurs alone. It is usually associated with other cardiac anomalies, making the total clinical picture complex. Seham [21] expressed the opinion that this condition is rarely recognized intra vitam, while Hochsinger [22] seemed to be able to diagnose the condition with comparative ease by the absence of physical signs in the presence of marked cyanosis and an abnormally accentuated pulmonary second sound at the base of the heart.

It is first of all important to differentiate two main groups of congenital heart diseases, those with and those without cyanosis. Abbott designated the noncyanotic group as an "arterial-venous shunt" in which cyanosis, if present, is only transient or terminal, while the cyanotic group is a "venous-arterial shunt," which comprises a variety of more serious conditions. It is in the latter group that transposition belongs.

The "venous-arterial shunt" with marked cyanosis occurs in pulmonary stenosis or atresia, biloculate and triloculate heart, persistent

21. Seham, M.: Congenital Heart Malformations, in Abt: Pediatrics, Philadelphia, W. B. Saunders Company, 1923, vol. 4, p. 275.

22. Hochsinger, C.: Wien Klin. **17**:47, 1891; also his article in Pfaundler and Schlossmann: The Diseases of Childhood, 1912, vol. 3, p. 490.

truncus arteriosus and transposition of the arterial trunks. Dextroposition of the aorta (the so-called Rechtslage of the German writers) with septal defect also causes cyanosis though of a moderate degree. When pulmonary stenosis is complicated by dextroposition of the aorta, hypertrophy of the right ventricle and an interventricular septal defect at the base, the combination known as "the tetralogy of Fallot," [23] there is a marked degree of cyanosis. Another condition accompanied by extreme cyanosis is aortic stenosis with mitral atresia and septal defect. Of all these anomalies, the most frequent is pulmonary stenosis in association with other defects. In the majority of cases of pulmonary stenosis, the murmur and thrill are definitely localizable and the absence of pulmonary accentuation with right-sided hypertrophy and

TABLE 3.—*Age at Time of Death in Complete Transposition*

Age	Present Series	Abbott	Vierordt
Born dead	4	1	3
1 to 24 hours	2	1	1
1 to 7 days	9	2	3
1 to 4 weeks	9	11	12
1 to 2 months	14	10	14
2 to 6 months	11	10	12
6 to 12 months	16	10	9
1 to 2 years	3	2	2
2 to 5 years	7	5	6
5 to 10 years	0	2	0
10 to 20 years	1	2	3
20 to 40 years	3	1	5
40 to 60 years	1	0	0
Age unmentioned	12	0	0
Total	92	57	70

congenital cyanosis are characteristic. In complete transposition, the murmur and thrill are often absent, and the pulmonary second sound is more often accentuated than weakened.

PROGNOSIS AND TREATMENT

The prognosis in complete transposition depends on one important associated condition, namely, the presence or absence of defect in the interventricular septum. On the whole, it may be remarked that the association of a septal defect is a happy combination of anomalies, for life may be fairly prolonged in such cases. The great majority of infants with this condition, however, die within the first year of life, according to the statistics collected for the present paper. The age at time of death may be tabulated and compared with the results of others as shown in table 3.

23. Fallot, A.: Contribution à l'anatomie pathologique de la maladie bleue (cyanose cardiaque), Marseille méd. **25**:77, 138, 202, 270, 341 and 403, 1888. A recent review of this interesting condition, together with report of a case, has been given by White, P. D., and Sprague, H. B.: The Tetralogy of Fallot, J. A. M. A. **92**:787 (March 9) 1929.

The oldest patient with typical transposition was in a case reported by Hedinger, that of a woman, aged 56, who was apparently in good health, except during pregnancy and just prior to death, when she showed signs of cardiac failure. This patient had a cor biatriatum triloculare, which condition is also thought to be a beneficial association with a transposition of the vessels.

As to treatment, none is needed and such measures as inhalation of oxygen gas through a rubber tube and the like not only are wasteful, but may be actually harmful. The ultramodern experimental administration of intravascular oxygen is interesting in animals, but wicked in human beings.[24]

SUMMARY

1. Congenital transposition of cardiac vessels is a comparatively rare condition, although ninety-two cases have been reported in the medical literature up to the end of 1929 that I have reviewed.

2. Two cases that came to autopsy in 1923 and three others occurring in 1929 at the Children's Memorial Hospital are reported in the present paper.

3. The condition produces a typical symptom of persistent cyanosis beginning at or soon after birth, with other physical signs singularly lacking in uncomplicated cases.

4. The anomaly, however, is often associated with some other cardiac malformations, the most important of which is the patent interventricular septum.

5. The prognosis is usually bad, life commonly terminating during the first year of life, although cases are found in which life is prolonged to adult age due to the association of other anomalies that tend to correct the deficient aeration of the blood.

1406 Gordon Street.

24. Abbott, M. E.: The Treatment of Congenital Cardiac Disease, The George Blumer Edition of Billings and Forchheimer: Therapeusis of Internal Medicine, New York, 1924, vol. 5, p. 342.

CYSTOGRAPHY IN INFANCY AND IN CHILDHOOD*

MEREDITH F. CAMPBELL, M.D.
NEW YORK

Cystography is the delineation of the bladder as obtained roentgenologically when this viscus is filled with a contrast medium. While cystography has become a highly valued and generally employed aid in the diagnosis of certain forms of disease of the urinary tract in adults, application of the method to kindred clinical problems in infants and children has not become extensive. Two factors in particular account for its relatively scant employment in pediatric cases: (1) lack of appreciation both of the potential diagnostic value of cystography and of its technical simplicity; (2) failure of physicians to seek urologic advice and aid in caring for these young patients having obvious disease of the urinary tract.

Although a normal cystogram will be obtained in a great many cases, a certain number will show striking evidence of urologic disease, and with surprising frequency properly interpreted cystograms alone will suffice to establish the correct diagnosis. In substantiation of the foregoing statement herewith are presented clinical observations on the diagnostic use of cystography in 150 pediatric cases in which I made a urologic examination during the past eighteen months. In two thirds of these supplementary urologic investigations, cystoscopy, ureteral catheterization and pyelography were carried out and served as additional factors in the diagnostic evaluation of cystography. Had cystography been utilized in a large number of other pediatric cases showing advanced urologic disease and in which only cystoscopy, ureteral catheterization and pyelography were performed, it is highly probable that the diagnostic value of cystography would have been even more strikingly demonstrated. Without jeopardy to these young patients there have been demonstrated vesical diverticulosis, various forms of neurogenic vesical disease, congenital vesical outlet obstructions and advanced inflammatory disease of the bladder walls, as well as serious involvements of both ureter and kidney.

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* From the Children's Medical Division and the Department of Urology, Bellevue Hospital, and the Pediatric Service, New York Nursery and Child's Hospital.

INDICATIONS FOR CYSTOGRAPHY

Cystography is indicated in all cases of urologic disease in infants and children except when an acute infection of the urinary tract is present. Fortunately, most cases of acute renal infection (clinically diagnosed acute pyelitis) clear up in from two to four weeks, irrespective of therapeutic efforts. A certain number of these patients, however, continue to show pus in the urine in spite of intensive treatment. I believe that all children with persistent pyuria after four weeks of proper medical care should be subjected to a thorough urologic examination. This has been the indication for investigations in the majority of those patients whose cystographic observations are reported here. Because many of these children had cystograms made within a few weeks (within a few days in some instances, for experimental observations), following the acute urinary infection, at which time uretero-

TABLE 1.—*Results of Cystography and Cystoscopy in Patients with Urinary Disease*

Normal cystogram, normal cystoscopy *	43
Abnormal cystogram, normal cystoscopy	0
Normal cystogram, abnormal cystoscopy	21
Abnormal cystogram, abnormal cystoscopy †	33
Normal cystogram, no cystoscopy	49
Abnormal cystogram, no cystoscopy ‡	4
Ureter reflux in 18 cases (12 per cent)	
Total	150

* Infection of the upper tract was found in many of these cases even though the cystoscopic picture was normal.
† This group includes ten cases of megalobladder due to neuromuscular hypotonia.
‡ An inadvertence.

vesical inflammatory changes were slight or absent, normal cystographic observations were most often obtained (table 1). As a corollary it may be stated that the more long standing the urinary disease, the greater will be the likelihood of abnormal cystograms.

While chronic pyuria is the indication in most instances, cystography may be employed to equal advantage in cases of neurogenic disturbances of the bladder; into this group fall a large proportion of the patients commonly designated as enuretic. It is noteworthy, moreover, that in many cases of neurogenic vesical disease chronic pyuria is an outstanding symptom. A palpable suprapubic mass or other evidence of vesical retention, persistent urinary frequency, difficulty, dysuria or vesical pain in children are further indications for cystography. Hematuria, when not due to hemorrhagic nephritis, always warrants cystoscopy and usually ureteral catheterization and pyelography as well. Cystography may be carried out in these cases but should be postponed in order that cystoscopy may be performed, if possible, at the time when bleeding is present. I have never felt that age was a contraindication. The youngest child in whom cystography was performed was 6 days

of age; this patient was born with pyuria and manifested extreme urinary difficulty (table 2). It should be noted that one in six of the patients was less than 1 year of age. I have never seen undesirable sequelae result from cystography in children.

TECHNIC OF CYSTOGRAPHY

With aseptic precautions the bladder is emptied by catheterization; the catheter is not withdrawn. If plain plates of the genito-urinary tract have not been made previously, one or two exposures should now be taken to show calculi, spina bifida, etc., if present. A sterile 5 per cent solution of sodium iodide is then slowly injected into the bladder until the child gives evidence of slight vesical distention. With the catheter still in situ, roentgen exposures are made; stereoscopic pictures should be made whenever possible. As a rule, only anteroposterior exposures are necessary, although in certain instances, as when diverticulosis or "cord bladder" is suspected or known to be present, lateral oblique pictures are of additional value. The bladder is now emptied of iodide, and the catheter is withdrawn.

TABLE 2.—*Ages of Patients in Whom Cystography Was Performed*

Age	No. Patients
Under 6 months	11
6 to 12 months	12
1 year	31
2 years	13
3 to 5 years	19
5 to 8 years	42
8 to 14 years	22
Total	150

Preliminary clearing of the intestinal tract favors more distinct films; an enema should always be given, so that any deformities or defects of the lumbosacral spine may not be overshadowed by a full rectum and lower bowel. As a rule, small soft rubber catheters are used; in the very young child, however, one must sometimes resort to ureteral catheters. Some have advised a modified Trendelenburg position during the filling of the bladder, as they believe that ureteral reflux is thereby rendered more likely. In my experience this maneuver has not proved of added advantage. The quantity of iodide injected varies greatly; a child aged 2 years, with a hypotonic bladder, will receive without discomfort a far greater quantity than will the normal child 6 years of age. As a rule, however, at the age of 2 years from 25 to 35 cc. are injected; at 6 years, from 60 to 75 cc., and at 10 years, from 90 to 100 cc. Many children will comfortably tolerate more than the amounts mentioned, but in any case the injection should always be stopped with the appearance of the slightest symptomatic evidence of vesical distention.

The target of the roentgen tube should be over the pubis and directed toward the bladder, so that the vesical outlet may be shown in the films. This is of particular importance in cases of neuromuscular vesical disturbances which are so frequently characterized by a funnel-shaped vesical outlet indicative of internal sphincter relaxation or paralysis. In young children, the Bucky diaphragm cannot be used, and "flash" exposures must be made between respirations. Unless abdominal movement occurs, a clearcut picture will be obtained even without the Bucky diaphragm, since the sodium iodide medium is so roentgenographically dense.

NORMAL CYSTOGRAMS

The conformation of normal cystograms varies greatly; the degree of bladder-filling is a most important factor. The well filled bladder which is not compressed by extravesical structures is round, oval or pyriform (fig. 1). While the filled bladder compressed by a low intra-abdominal mass is usually kidney-shaped, this conformation may be seen also in the uncompressed, partially filled viscus. Moreover, with incomplete filling, the bladder dome may appear squared off

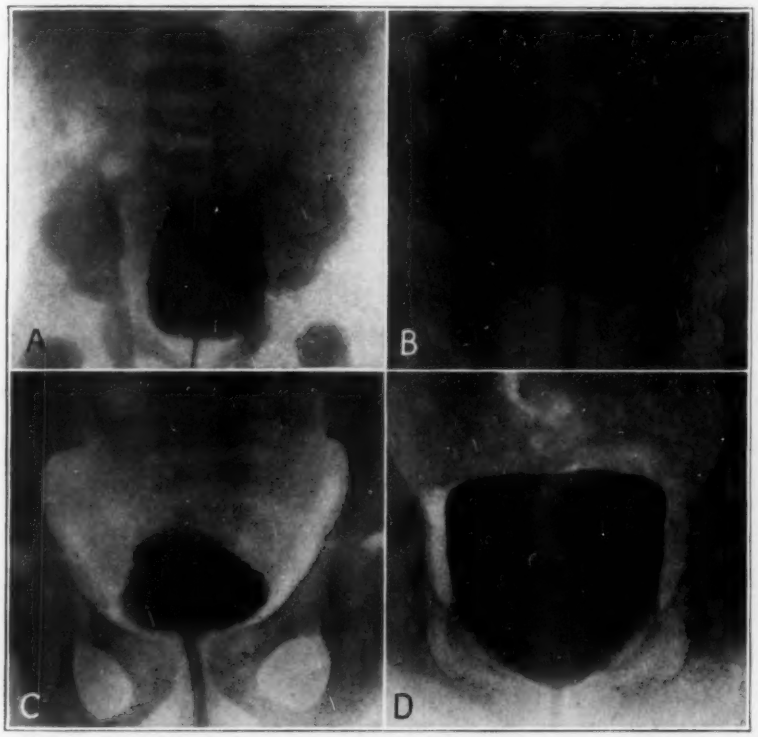

Fig. 1.—Normal cystograms in children: *A*, appearance of bladder in a patient, aged 6 days, with marked urinary difficulty and pyuria since birth; note that catheterization was accomplished with ureteral catheter; *B*, kidney-shaped bladder outline due to incomplete filling; *C*, normal outline of frequently observed conformation; *D*, "squared-off" appearance of bladder dome due to incomplete filling.

(fig. 10). If the hips are not squarely before the film (pelvic rotation), the normal bladder may appear elongated to one side or eccentric (fig. 2 *B*), as the filled bladder usually assumes a direction toward the urachus. Normally, the vesical outlet is not evident in the cystogram; the outline of the lower segment of the bladder is sharply defined. In the normal cystogram, no ureteral reflux is present. In approximately

a third (forty-three) of this series a normal cystoscopic picture was found to accompany a normal cystogram. In three fourths of these, ureteral catheterization revealed infection of the upper urinary tract on one or both sides; obviously, this infection had not involved the ureterovesical valves. This observation is mentioned to point out that normal cystographic and cystoscopic (bladder picture) observations alone are insufficient to rule out potentially serious disease of the upper urinary tract. On the other hand, no case was encountered that showed an abnormal cystogram when the cystoscopic observations were normal.

Inadvertently, in four cases showing an abnormal cystogram a cystoscopy was not done. The cystographic observations in these cases were: (1) a markedly eccentric bladder; (2) a fuzzy, motheaten outline apparently due to intense cystitis, evidence of which was clinically

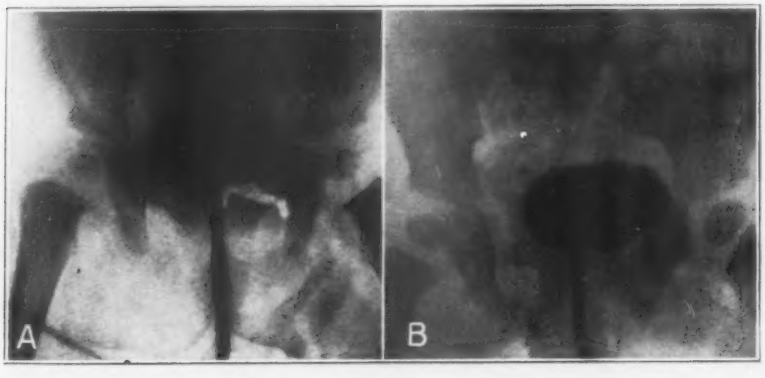

Fig. 2.—*A*, irregular motheaten appearance of bladder outline in a child, aged 5 months, with intense cystitis associated with acute pyelonephritis; *B*, eccentric appearance of bladder outline due to pelvic rotation. The right hip is elevated; the bladder is seen in oblique. With the hips squarely on the table, a normal concentric outline was obtained.

manifested; (3) unusual lobulation of the bladder, and (4) an extremely irregular bladder deviating to the right in a case of congenital syphilis.

ABNORMAL CYSTOGRAMS

Because of the variety of forms assumed by the normal cystogram, the recognition of the abnormal is sometimes difficult, I believe that the diagnosis of a normal bladder contour should be made with considerable latitude. The pathologic cystogram may be characterized by irregularity of outline, indentations or bulgings of the walls, ureteral reflux or changes about the vesical outlet. These conditions may result from infection, diverticulosis, infravesical obstructions, intravesical or extravesical masses or growths and various forms of neuromuscular disturbances.

Infection of the bladder wall of marked intensity or of long duration is frequently manifested in the cystogram by a fuzziness or moth-eaten irregularity of the bladder outline (fig. 2 *A*). By this criterion, severe localized mural cystitis may sometimes be diagnosed by cystogram. It should be noted, however, that in nearly all of the twenty-one cases of this series showing a normal cystogram but an abnormal cystoscopic picture, the pathologic condition of the bladder was one of

Fig. 3.—Bilateral ureteral reflux from a partially filled bladder. Severe colon bacillus cystitis; bladder urine grossly purulent. Catheterized ureteral specimens culturally and microscopically negative. The ultimate dissemination of the bladder infection to the upper tract by reflux seems most likely, a point of considerable clinical importance.

inflammation and was usually secondary to infection of the upper tract. When marked cystitis is present, ureteral reflux will often be noted on one or both sides depending, of course, on the degree of inflammatory involvement of the ureterovesical valves (figs. 3, 4 and 5).

Diverticulosis is indicated by characteristic outpocketings from the wall of the bladder. In order best to demonstrate these lesions, it is

advantageous to take the pictures from several angles; that is, when the diverticulum springs from the floor of the bladder, lateral or lateral oblique exposures are preferable. Diverticula are most strikingly demonstrated by stereoscopic cystograms.

An excellent method to bring out contrast in vesical diverticulosis is that suggested by Hinman. After taking the cystogram of the full bladder and diverticulum (fig. 6 *A*), the bladder is emptied of iodide

Fig. 4.—Pyelonephritis in a child, aged 6 years, with associated cystitis. Cystography clearly outlines the hydronephrotic right kidney and shows some reflux up the left side. Persistent pyuria instigated this examination.

and refilled with air. Pictures then made show the diverticulum more or less completely filled with iodide, as contrasted with the outline of the bladder in the pneumogram (fig. 6 *B*). In one of our cases, a boy, aged 2 years, with congenital contracture of the bladder neck, a large stone nearly filled a diverticulum of the bladder dome (fig. 7).

Ureteral reflux from the bladder occurs when the ureterovesical valve mechanism is functionally damaged. While infection is the most common damaging agent bringing about reflux, in many instances neuromuscular vesical disease or obstructions of the lower tract with resultant back pressure are the underlying causes, aided, as a rule, by infection. When the bladder is filled with iodide, reflux may be demon-

Fig. 5.—Cystogram in a girl, aged 10 years, having frequently recurring attacks of acute cystitis with pyuria over a five year period. The acute attacks, which had been treated by bladder irrigations, were caused by a large vesical calculus. There is also a large diverticulum (fig. 6) of the right lateral bladder wall as well as left hydronephrosis. The urogram suggests the possibility of aberrant vessel obstruction causing the hydronephrosis. The stone was removed by suprapubic cystotomy; the condition of the child has not as yet warranted diverticulectomy.

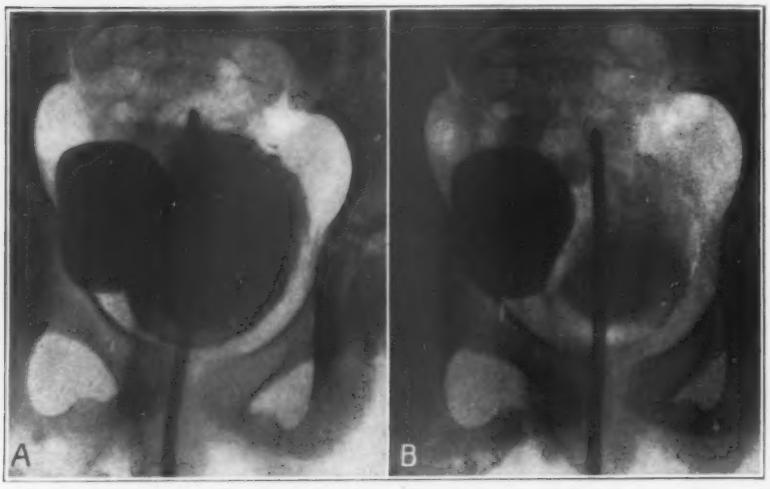

Fig. 6.—*A*, cystogram made following the removal of the bladder stone shown in figure 5. The diverticulum of the right lateral bladder wall is clearly defined. Cystoscopically, the diverticulum orifice is extremely small. *B* shows the same area following the replacement of the bladder iodide with air. The bladder is now outlined in the pneumogram; the diverticulum remains distended. A small amount of iodide leaking into the bladder casts a faint shadow.

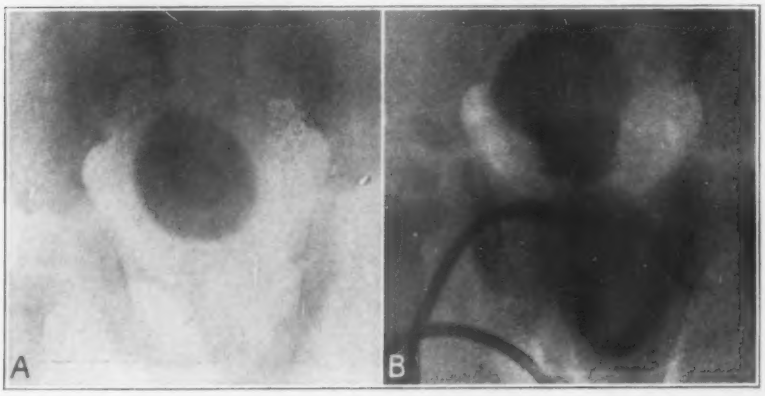

Fig. 7.—*A*, large calculus in diverticulum of bladder dome in a boy, aged 2 years, with congenital contracture of the bladder outlet; *B*, cystogram in same case showing filling of diverticulum; the outline of the bladder proper below is not clearly defined. Cystoscopy indicated the diverticulum to be approximately the same size as the bladder; the orifice of the sac was of moderate size.

strated to extend only a short distance up the ureter or it may extend as high as the pelvis of the kidney and outline the upper tract completely, thereby eliminating the need of performing pyelography (figs. 3, 4, 5, 6, 7, 8, 9 and 10).

It has been stated by some writers that reflux may occur in the normal bladder of the child; Kretschmer reported this observation in

Fig. 8.—In performing pyelography in a girl, aged 5 years, with left renal infection, not only did the iodide reflux into the bladder but it refluxed up the adjacent reduplicated ureter outlining both of the reduplicated renal pelves. This demonstration indicates the serious clinical possibilities for spread of renal infection by reflux from an infected pelvis to a noninfected pelvis.

four of twelve normal bladders in children.[1] I have never observed such an instance. This is a most important point and merits elaboration. In Kretschmer's twelve cases, for example, cystography was performed

1. Kretschmer, H. L.: Cystography, Surg. Gynec. Obst. **23**:709, 1916.

under general anesthesia. I never make an injection into an anesthetized patient for either cystography or pyelography. Recently Gruber [2] showed conclusively, I believe, that when the normal bladders of anesthetized animals are distended under abnormally high pressure, reflux occurs in some instances. The explanation is anatomic. With great distention of the bladder the small leaflet of mucous membrane

Fig. 9.—"Cord bladder" of myelitis in a girl, aged 6 years. The bladder residuum was 12 ounces (354.9 cc.) of purulent urine. Not only is the bladder enlarged but bilateral reflux clearly outlines the abnormally enlarged ureters and renal pelves. Such a urographic demonstration, intelligently performed, may be accomplished without jeopardy to the child and renders cystoscopic observation unnecessary in some cases.

which curtains the opening of the ureter and which is the true valve is pulled upward and away. This leaves the orifice uncovered. Through this temporarily unprotected opening, reflux occurs. He noted in those

2. Gruber, C. M.: The Uretero-Vesical Valve, J. Urol. **22**:275 (Sept.) 1929.

cases showing reflux under abnormally high pressure-volumes that when the pressure-volume valves were reduced to those which would be tolerated by the conscious patient the valve was not incapacitated, and reflux did not occur.

In certain cases, the etiologic factor causing reflux must be considered as congenital. In four cases seen at autopsy in recent months,

Fig. 10.—Greatly dilated bladder and upper urinary tract in a boy, aged 2 years, with congenital valvular obstruction of the posterior urethra. Although the cystographic picture of this condition and that shown in figure 9 are closely similar, cystoscopy at once establishes the correct diagnosis.

proof of the congenital origin (probably on a neuromuscular basis) was demonstrated. The incidence of bladder reflux in this series of 150 cases is considerably higher than that observed by others. Eighteen, or 12 per cent, showed reflux, bilateral in ten and unilateral in eight. In twelve of these the entire upper tract of the involved side or sides was outlined by reflux. In one instance of ureteral reduplication, both

of the double ureters showed reflux outlining distinctly the reduplicated renal pelvis (fig. 8).

Hypotonia or functional atony of the ureterovesical valves is sometimes observed to be the cause of reflux. In these cases, a similar condition not infrequently involves the vesical outlet. I have found this to be true particularly in certain cases in which the clinical diagnosis was enuresis (fig. 11). On the other hand, ureteral reflux may result from the back pressure caused by the chronic sphincterospasm of neurogenic vesical disease (fig. 9). In some instances of vesical hypotonia, the bladder outline may be enormous; I have noted this condition particularly in choreic children (fig. 12).

While ureterovesical tuberculosis (secondary to renal disease) occasionally causes ureteral reflux in adults, reflux of this origin is

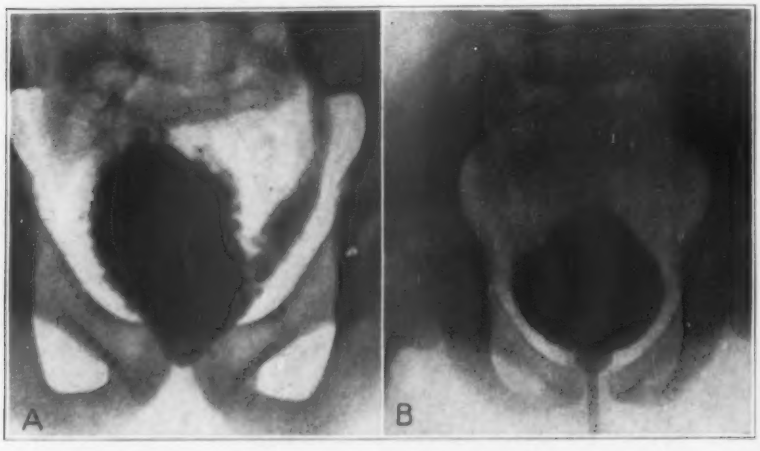

Fig. 11.—*A*, irregular pyriform bladder outline with marked sacculation of bladder wall, and ureteral reflux, in a boy, aged 10 years, with "cord bladder." The funnel-shaped bladder outlet due to paralysis of the internal sphincter is noteworthy as characteristic of paralytic neuromuscular vesical disease. In this case congenital sacral deviation to the right caused both sensory and motor loss of the first to the fifth sacral nerves. The child had been treated for enuresis. *B*, cord bladder in a girl, aged 5 years, with "enuresis." The funnel-shaped vesical outlet due to paralysis of the internal sphincter is well demonstrated.

seldom encountered in children, owing to the rarity of surgical renal tuberculosis in the young. I have observed this condition but once in childhood. On the other hand, nontuberculous infections are extremely common and as a result of inflammatory infiltration or scarring of the ureterovesical valve, reflux is frequently observed when the infection has been of considerable intensity or duration. Furthermore, the valvular involvement may result from intense vesical infection alone without involvement of the upper tract.

It is well to point out here in conjunction with the cystographic diagnosis the great clinical importance of reflux, particularly as it aids in the dissemination of urinary infection. By means of this phenomenon, tuberculosis of one kidney, for example, may be spread down the ureter to the bladder and by reflux reach the other kidney. Although the second kidney still may be uninfected, ureteral catheterization will often reveal tubercle bacilli from this side (reflux from the bladder) and thus lead to an erroneous conclusion.

Nontuberculous urinary infections are of far greater incidence than are tuberculous infections in children, and therefore merit greater consideration. It is of interest in this connection that Helmholz expressed his belief that reflux is of more importance than any other factor in the production of renal infections in the very young.[3] While the present studies on renal infection in children have not indicated that

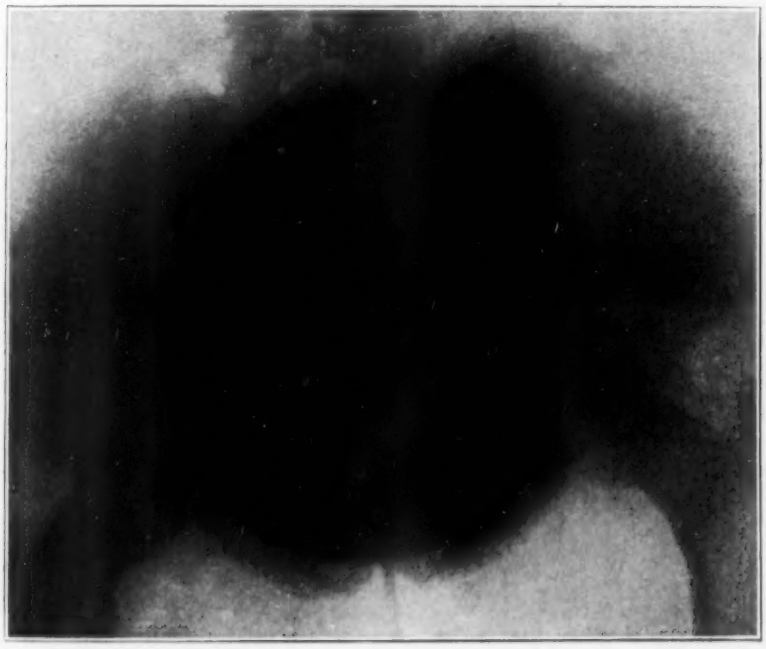

Fig. 12.—Vesical hypotonia associated with chorea in a girl, aged 10 years. By cystometric observation, the bladder musculature was found to be extremely hypotonic; 500 cc. of fluid caused neither discomfort nor marked increase in intravesical pressure. In a series of choreic children thus examined, vesical hypotonia was a uniform observation; all showed abnormally large cystograms, and the injection of an unusual amount of iodide caused no discomfort from distention.

3. Helmholz, H. F., quoted by Eisendrath, D. N.; Katz, H., and Glasser, J. M.: Bladder Reflux, J. A. M. A. **85**:112 (Oct. 10) 1925.

the ascending route was the predominant route of infection, ureter reflux without vesical or ureterovesical infection was never observed. It must be remembered, however, that transient dysfunction of the ureterovesical valves may occur at the time of a severe local reaction (cystitis), and normal function may again be resumed with the subsidence of the inflammation.

Fortunately, reflux from an infected bladder does not always cause immediate renal infection. I have under observation now a girl, aged 4 years, with a marked colon bacillus cystitis and bilateral ureteral reflux to the pelves of the kidney (fig. 3). Catheterized specimens from the renal pelves are still clear and sparkling, pus-free and bacteriologically sterile. In such a case, however, it seems but a matter of time before severe renal infection will ensue.

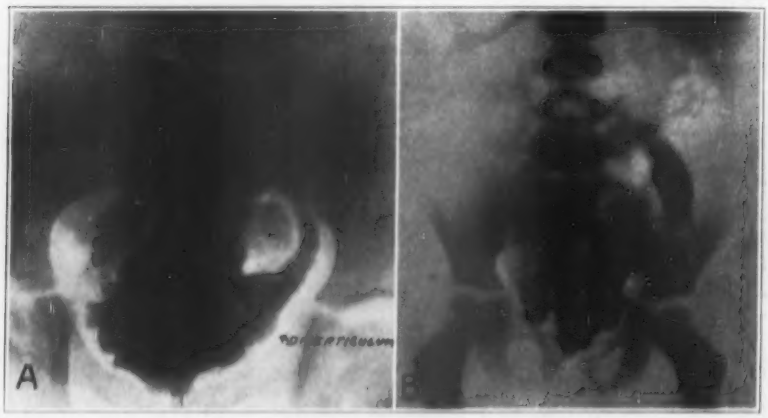

Fig. 13.—*A*, markedly irregular bladder outline with bilateral ureteral reflux. In this case, that of a boy, aged 3 years, with congenital vesical outlet contracture, four diverticula of the bladder were present. In the cystogram, only one shows clearly. *B*, cystogram of the same region made following cystotomy drainage preparatory to removal of the contracture. The enormous size of the ureter as outlined by reflux is evident.

Reflux cannot be conclusively demonstrated without cystography even though there is certain clinical evidence of its likelihood. While renal pain occurring at the time of or immediately following urination or appearing when an injection is made forcibly into the bladder strongly suggests ureteral reflux, a cystogram should always be made to establish the correct diagnosis.

Spastic contracture of the bladder musculature is believed by some to be the common cause of reflux; the idea is advanced that the ureteral valves are held open by the muscle spasm. The soundness of this theory is upset not only by the observation of reflux as it occurs in the atonic

bladder, but by experimental distention of the normal bladder under great pressure without ureteral reflux.

Obstructions of the lower urinary tract are occasionally observed in infants and children, and when present are of congenital origin in nearly all cases. Congenital contracture of the vesical outlet (fig. 13) or congenital valves of the posterior urethra (fig. 10) and the previously mentioned chronic sphincterospasm of "cord bladder" (fig. 9) are the most common forms of obstruction of the lower tract. Dilatation of the bladder, diverticulosis and ureteral dilatation with reflux are common sequellae and indicate the site of the blockage. Rarely is obstruction due to urethral stricture in childhood.

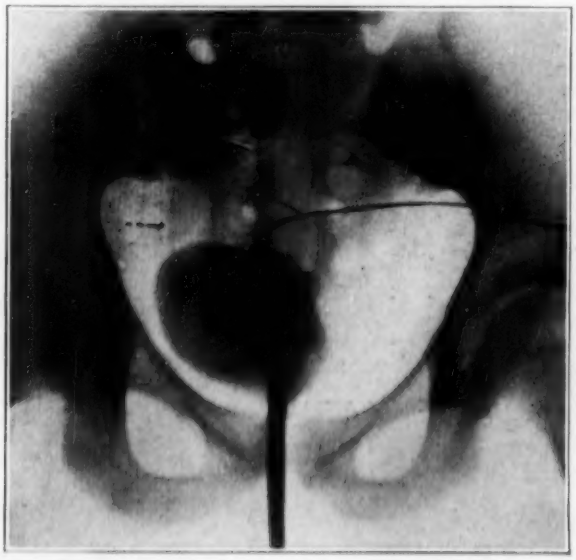

Fig. 14.—Lateral displacement of the bladder by tuberculosis of the left seminal vesicle in a boy, aged 14 years. This is a rather characteristic picture indicating extravesical pressure.

Intravesical growths are so rare in childhood that they warrant scant comment here. This condition, however, is cystographically indicated by a motheaten-appearing filling defect of the bladder cavity. Extravesical neoplasia or inflammatory masses may compress the bladder or push it to one side, but these perivesical lesions also are of rare occurrence (fig. 14).

SUMMARY

Cystography is a simple method by which certain forms of disease of the urinary tract can be demonstrated roentgenologically without jeopardy to the young patient. In some instances, the cystogram alone

will establish the correct diagnosis; in other cases, arrival at the correct diagnosis will thereby be greatly facilitated. Cystography is indicated in the presence of chronic pyuria, enuresis, chronic urinary difficulty, frequency, dysuria, vesical pain or a suprapubic mass. Acute urinary infection contraindicates cystography. In the presence of hematuria that is not due to hemorrhagic nephritis, cystoscopic should precede cystographic investigations.

With the exception of vesical neoplasia, there are demonstrated in pediatric patients, by means of cystograms, all the usual pathologic lesions of the bladder and upper urinary tract which are demonstrable in adults by this method. These lesions include infections, vesical diverticulosis, the various forms of neuromuscular disease of the bladder and obstructions of the bladder outlet, together with changes in the upper tract commonly resulting from these conditions.

Pediatric Biographies

JEAN A. ASTRUC
1684–1766

JOHN RUHRÄH, M.D.
BALTIMORE

When Louis XV was seated on the throne of France, he had as "médecin" consultant a man of remarkable intellectual activity and ability, an author, investigator and practitioner, whose fields of interest went afar from medicine. Osler once wrote that if one asked thirty physicians who Astruc was, doubtless none would have heard of him. Yet in his day few were as widely known, and few the medical men of the time whose books were as widely read.

Astruc was born on March 19, 1684, at Sauve in Languedoc, and died on May 5, 1766. His father, a Huguenot clergyman of a well connected family, turned Roman Catholic, and his son Jean never knew any other religion, and was a staunch son of the church. He studied at Montpellier, where he received the degree of bachelor of medicine in 1702, and his doctorat the following year. From 1706 to 1710, he taught as a supplementary professor, and then went to Toulouse to teach anatomy until 1715. He subsequently went to Paris to finish his book on venereal diseases. In 1729 he was made physician to the King of Poland, but he evidently preferred his busy but scholarly life at Paris, as he returned the next year and was appointed physician to the King of France. In 1731, Geoffroy, who taught medicine in the royal college, died, and Astruc was made "Professeur Royal du Médecine."

His interests ranged from theology to the natural sciences, and one of his first publications was "Historie naturelle de Languedoc." This he hesitated to publish, as he says: "Because it seemed to me that it was not becoming in a person engaged in a very serious and very exacting profession to take himself up with researches in pure physics or literature." He got bravely over this feeling, and published many books on various topics.

He was a great student of theology, and is regarded as the father of modern higher criticism. He hesitated to publish some of his writings on biblical subjects lest he offend, but finally did so on advice of his religious associates. His account of Adam and Eve on the occasion of the birth of their first son is a remarkable document, and is added as a letter to his work on obstetrics. He claimed God came down and taught them the necessary obstetrical procedures. An account of "Sir Jean Astruc and His Conjectures" by Simpson is worth reading.[1]

1. Simpson, Alexander: Edinburgh M. J. **14**:461, 1915.

Dr. ASTRUC.

His most important medical works are his "De Morbis Veneris," 1736; "Traité des Maladies des Femmes," 1761-1765; "L'Art d'accoucher réduit à ses principes," 1766, which contains a summary of the history of obstetrics. He also wrote on hydrophobia, plague, digestion, anal fistula and numerous other topics.

One extremely instructive passage shows how he rejected the suggestion that syphilis might be due to micro-organisms. It did not fit with cut and dried opinions of his time, so it was nonsense. The same thing is seen today both in science, art and music, to say nothing of government.

There are some, however, whom I forbear now to spend Time in imputing, such as Augustus Hauptman and Christian Langius, who think that the Venereal Poison is nothing else but a numerous School of little nimble, brisk invisible living things, of a very prolific Nature, which when once admitted, increase, and multiply in Abundance; which lead frequent Colonies to different Parts of the Body; and inflame, erode, and exulcerate the Parts they fix on; . . . in short, which without any Regard had to the particular Quality of any Humour, occasion all the Symptoms that occur in the Venereal Disease. But as these are mere visionary Imaginations, unsupported by any Authority, they do not require any Argument to invalidate them . . . if it was once admitted, that the Venereal Disease could be produc'd by invisible living things swimming in the Blood, one might with equal Reason alledge the same Thing, not only of the Plague, as Athanasius Kircher, the Jesuit, formerely, and John Saguens, a Minim, lately have done, but also in the small-pox, Hydrophobia, Itch, Tetters, and other contagious Diseases, and indeed of all Distempers whatsoever; and thus the whole Theory of Medicine would fall to the Ground, as nothing could be said to prove the Venereal Disease depending upon little living things which might not be urged to prove that all other Diseases were derived from the like little living things though of a different Species, than which nothing can be more absurd.

His work on children is a rare item, presumably published in French first. The writer has only seen the English translation. The original French edition is apparently not in the Army Medical Library, and is not mentioned by Eloy, or Bayle and Thillaye. Garrison does not mention Astruc in his "History of Pediatrics," nor does von Bokay, nor is his book listed by Meissner.

The book is entitled: "A General and Compleat Treatise on All the Diseases Incident to Children From Their Birth to the Age of Fifteen. With Particular Instructions to tender Mothers, Prudent Midwives, and Careful Nurses." The translator is unknown. In the preface, Astruc says:

The principal motive which induced me to publish these lectures, is the great reputation Doctor Astruc's works bear among the learned; not only for his perspicuity in theory, justness in his principles, but success in his practice, which have gained him an universal approbation, and make this work perferable to any thing written on the present subject: for all the authors who have hitherto treated of the diseases of children, if *Originals*, are either too confused and imperfect, or not sufficiently copious; if *Compilers*, they are unintelligible from

A GENERAL and COMPLEAT

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WITH

Particular INSTRUCTIONS to tender Mothers, prudent Midwives and careful Nurſes.

The whole made Familiar to every CAPACITY.

By the LEARNED

Dr. *JOHN ASTRUC,*

Regius Profeſſor of MEDICINE at *Paris.*

AND

Chief Phyſician to his preſent Majeſty the King of FRANCE, *&c.*

LONDON.

Printed for JOHN NOURSE, at the *Lamb,* againſt *Katherine-Street,* in the *Strand.*

MDCCXLVI.

Title page of Astruc's "Treatise on All the Diseases Incident to Children."

their injudicious collections; wherefore to supply these defects, the Dr. has endeavoured to keep a medium; insert nothing superfluous, neglect nothing necessary, and to adopy the stile to the meanest capacity.

The translation consists of 229 pages. It is preceded by a glossary, and evidently the translator did not have a very high opinion of his prospective reader's linguistic abilities. His definitions are terse and anglosaxon. For example, abdomen, the belly; collyrium, a medicine for the eyes; eructation, a windy belching; iliac passion, a stopping the guts with violent pain; intestines, the guts; paroxysm, a fit; phthyriasis, the lowsy distemper. His definition of thymus is interesting, "a gland which separates the lymph from the blood for softening the lungs."

The main body of the book is preceded, too, by seventeen pages of directions for caring for new-born infants. These are evidently written largely for the midwife, and contain minute directions for the tying of the umbilical cord. The directions are not unlike those given today, even to the application of the dressing, the inner layers of which Astruc recommends to be dipped in oil of roses, doubtless a reliable antiseptic.

Directions are given for observing whether the meconium is entirely evacuated or not. He recommends a small spoonful of sugared wine twice or thrice a day, and states that the Jews give their infants a little butter and honey. And here, Astruc shows his knowledge of Holy Writ, for he says:

> And this they do, to follow what is said in Isaiah VII, 14-15: "Behold, a virgin shall conceive, and bear a son, and shall call his name Emanuel. Butter and honey shall he eat, that he may know to refuse the evil and chuse the good."

Again, his remarks on maternal nursing are of interest. They emphasize the importance of this form of nourishment, and also that the failure of mothers to suckle their offspring is not a thing of the twentieth century which is ours, nor of the eighteenth, which was Astruc's, but a problem dating back into antiquity. On this point he quotes Lamentations IV, 3 and Job XXXIX, 16:

> The sea-monsters draw out the breast; they give suck to their young ones; the daughter of my people is become cruel like the ostrich in the wilderness, which is hardened against her young ones, as tho' they were not hers.

He considers at more or less length the various disorders of infants and children as were generally written about in his time, thirty-two chapters in all. He is a little wordy, but less so than most French authors, and he systematically considers the diseases in a general way, the symptoms, diagnostics, prognostics and cure.

He is chary of opiates, but recognizes their use as in his chapter "Of the Watchings of Children":

> If the evil be very obstinate, narcoticks should be prescribed, though some dread them, alledging that they intoxicate and stupefy these young patients; which I own is true, as well as regards to these, as to adults, if the narcoticks

be continued too long, or given in too great a dose; but in moderate doses, they are extremely useful in this case.

Which is as clean a statement of all pediatric experience as one could wish.

Some of his therapeutic measures are of the brainless variety so common in all ages. For idiopathic epilepsy, he recommends among other things, "The powder of vipers, that of worms, that of a wolf's liver, amber, peony, mistletoe of the oak, and human scul." All of which reads not unlike some of the present day circulars.

One extract may be given, that on the treatment of diarrhea:

Cure. Few medicines are employed in these disorders, both because of the delicafe constitutions of children, and the repugnance they have to drugs; so that a proper regimen is the only thing a physician can depend on.

I. Therefore a suitable diet should be prescribed. If the infant sucks, part of his milk should be retrenched, and its quality carefully examined: if it be not good, the nurse should be treated with proper remedies. If the child be weaned he should abstain from his pap, flesh meat, &c. and must be confined to a little soupe, which should be very light, for meat soupes, such especially as are fat, are very subject to putrifaction, wherefore some pot-herbs should be boiled therein; you may also add the yolk of an egg to the soupe, or simple broth.

II. After these remedies, you proceed to purgatives, or emetics; the last of which are generally the most efficacious: But they are to be ordered principally when the patient is inclined to vomit, and when his stomach is over-charged. Purgatives are useful in the dysentery, especially the Ipecacuana; because it evacuates, and at the same time attenuates the viscid and mucous humours. It may be ordered from two to ten grains, according to the infant's age, beginning always rather by an half, than a full dose; and if the first does not operate, you may the more safely proceed to a stronger; you may order by the same gradation and caution, the stibiated tartar. Among the purgatives, rhubarb should be principally employed if the patient's age can bear it. As these remedies are the most efficacious in these fluxes, they should be now and then repeated.

III. After purgatives, we are to order mild stomachics, as the confections of alkermes, that of hyacinth, and the theriaca, to 12, 15, or 20 grains. The two first should be exhibited in the morning, and the theriaca at night, because of the laudanum it contains, which disposes the patient to rest; or the following stomachics may be employed as myrrh, or mastichs, to 3 or 4 grains, or oriental saffron, which is anodyne and stomachic at the same time.

IV. After the stomachics, absorbents are prescribed, as are also astringents, as crabbs eyes, or harts-horn, to eight grains twice a-day. These absorbents may be combined with astringents in the form of boluses, electuaries, &c. with syrup of myrrh, or that of quinces.

V. If all these remedies be still employed in vain, and the patient is very much griped, narcotics are to be prescribed, milder or stronger, according to the child's age.

As to bleeding, it is commonly useless in these fluxes. But if the pains be very violent, it may be instituted, drawing more or less blood, according to the patient's age, strength, &c.

Finally, anodyne clysters should be prescribed; they are made of the decoction of tripes, or of veal, and the oil of sweet almonds, or a decoction of mullein, in which is boiled a poppy-head, or they may be made of whey and brown sugar.

News and Comment

GENERAL

Committee on Medical Care for Children.—A committee on medical care for children, of the White House Conference on Child Health and Protection, is composed of the following members:

Isaac A. Abt, M.D., professor of pediatrics, Northwestern University Medical School, Chicago; 104 S. Michigan Blvd., Chicago.

Charles A. Aldrich, M.D., associate attending physician, Children's Memorial Hospital, Chicago; 545 Lincoln Ave., Winnetka, Ill.

John E. Anderson, Ph.D., director, Institute of Child Welfare, University of Minnesota; Institute Child Welfare, Minneapolis.

Ellen C. Babbitt, staff associate, American Child Health Association, New York, 370 Seventh Ave., New York.

Edith Baker, president, American Association for Hospital Social Workers, 18-20 E. Division St., Chicago.

Miriam Birdseye, extension nutritionist, United States Department of Agriculture, U. S. Department of Agriculture, Washington, D. C.

Mrs. Anna DePlanter Bowes, in charge of nutrition, education and demonstration, Philadelphia Child Health Society, 311 S. Juniper St., Philadelphia.

Joseph Brennemann, M.D., president, American Pediatric Society, Children's Memorial Hospital, 707 Fullerton Ave., Chicago.

Lloyd T. Brown, M.D., instructor in orthopedic surgery, Harvard University Medical School, 372 Marlborough St., Boston.

Harvey J. Burkhart, D.D.S, director, Rochester Dental Dispensary, Rochester, New York.

Bailey B. Burritt, general director, Association for Improving the Condition of the Poor, 105 East 22nd St., New York.

Ida M. Cannon, R.N., chief of social service, Massachusetts General Hospital, Fruit St., Boston.

M. Antoinette Cannon, R.N., chairman, Committee on Education, American Association of Hospital Social Workers, New York School of Social Work, 105 East 22nd St., New York.

J. B. Carnett, M.D., vice dean and professor of surgery, Graduate School of Medicine, University of Pennsylvania, 2012 Spruce St., Philadelphia.

Howard C. Carpenter, M.D., professor of pediatrics, Graduate School of Medicine, University of Pennsylvania, 1805 Spruce St., Philadelphia.

Taliaferro Clark, M.D., senior surgeon, United States Public Health Service, Washington, D. C.

S. Lillian Clayton, R.N., director of nurses, Philadelphia General Hospital, president, American Nurses' Association, 34 Pine St., Philadelphia.

Bronson Crothers, M.D., assistant professor of pediatrics, Harvard Medical School, 300 Longwood Ave., Boston.

Samuel J. Crumbine, M.D., general executive, American Child Health Association, 370 Seventh Ave., New York.

Wilburt C. Davison, M.D., dean and professor of pediatrics, Medical School, Duke University, Durham, N. C.

Laurence R. DeBuys, M.D., profressor of pediatrics, Tulane University of Louisiana School of Medicine, 1417 Delachaise St., New Orleans.

William DeKleine, M.D., medical assistant to the vice chairman, American Red Cross, Washington, D. C.

Lester J. Evans, M.D., associate, Division of Rural Hospitals, The Commonwealth Fund, Fuller Bldg., 57th St. and Madison Ave., New York.

Harold K. Faber, M.D., professor of pediatrics, Stanford University School of Medicine, Stanford University Hospital, San Francisco.

Edna L. Foley, R.N., superintendent, Visiting Nurses Association, 104 S. Michigan Ave., Chicago.

Franklin P. Gengenbach, M.D., associate professor of pediatrics, University of Colorado School of Medicine, 1612 Tremont St., Denver.

Lucy Gillett, director, nutrition work, Association for Improving the Condition of the Poor, 105 East 22nd St., New York.

Stella Goostray, R.N., superintendent, School of Nursing, Children's Hospital, 300 Longwood Ave., Boston.

Clifford G. Grulee, M.D., clinical professor of pediatrics, Rush Medical College, University of Chicago, 310 S. Michigan Blvd., Chicago.

Henry F. Helmholz, M.D., professor of pediatrics, Mayo Foundation, University of Minnesota, Mayo Clinic, Rochester, Minn.

T. C. Hempelmann, M.D., assistant professor of clinical pediatrics, Washington University School of Medicine, 508 N. Grand Blvd., St. Louis.

Percy R. Howe, D.D.S., director, Forsyth Dental Infirmary for Children, 140 Fenway, Boston.

Edgar J. Huenekens, M.D., associate professor of pediatrics, University of Minnesota Medical School, 87 S. Seventh St., Minneapolis.

Horace H. Jenks, M.D., assistant professor of pediatrics, Graduate School of Medicine of the University of Pennsylvania, 918 Clinton St., Philadelphia.

Armin Klein, M.D., assistant professor of orthopedic surgery, Tufts College Medical School, 483 Beacon St., Boston.

J. H. Mason Knox, Jr., M.D., chief, Bureau of Child Hygiene, State of Maryland, Department of Health, 2411 N. Charles St., Baltimore.

Adrian V. S. Lambert, M.D., chairman, Executive Committee on Convalescence, Welfare Council of New York City, 168 East 71st St., New York.

William P. Lucas, M.D., professor of pediatrics, University of California, Medical School, 490 Post St., San Francisco.

Kate McMahon, R.N., director, Medical Social Work, Simmons School of Social Work, 18 Somerset St., Boston.

Williams McKim Marriott, M.D., professor of pediatrics, Washington University School of Medicine, 500 S. Kingshighway Blvd., St. Louis.

Adolf Meyer, M.D., Henry Phipps professor of psychiatry, Johns Hopkins University School of Medicine, Johns Hopkins Hospital, Baltimore.

Guy S. Millberry, D.D.S., dean, College of Dentistry, University of California, Berkeley, Calif.

LeRoy M. S. Miner, M.D., D.M.D., dean and professor clinical oral surgery, Harvard Dental School, 363 Marlboro St., Boston.

Lucy Minnigerode, R.N., chief nurse, United States Public Health Service, Washington, D. C.

A. Graeme Mitchell, M.D., professor of pediatrics, University of Cincinnati College of Medicine, Children's Hospital, Cincinnati.

Fred Moore, M.D., school medical inspector, 410 Sixth Ave., Des Moines, Ia.

William A. Mulherin, M.D., professor of clinical pediatrics, University of Georgia Medical Department, 753 Broad St., Augusta, Ga.

Frank C. Neff, M.D., professor of pediatrics, University of Kansas School of Medicine, 406 W. 34th St., Kansas City, Mo.

Mary Riggs Noble, M.D., chief, Preschool Division, Pennsylvania Department of Health, Harrisburg, Pa.

Robert B. Osgood, M.D., professor of orthopedic surgery, Harvard University Medical School, 372 Marlboro St., Boston.

George T. Palmer, Dr.P.H., director, Division of Research, American Child Health Association, 370 Seventh Ave., New York.

Helen Chesley Peck, R.N., executive secretary, Infant Welfare Society, 240 Citizens Aid Bldg., Minneapolis.

James Stuart Plant, M.D., director, Essex County Juvenile Clinic, 502 High St., Newark, N. J.

Winifred Rand, R. N., Merrill Palmer School, 71 Ferry Avenue E, Detroit.

Esther L. Richards, M.D., assistant professor of psychiatry, Johns Hopkins University School of Medicine, Johns Hopkins Hospital, Baltimore.

Lydia Roberts, M.D., professor of nutrition, University of Chicago, Chicago.

Aldert Smedes Root, M.D., 131 W. Hargett St., Raleigh, N. C.

Lawrence T. Royster, M.D., professor of pediatrics, University of Virginia Department of Medicine, University, Va.

Louis C. Schroeder, M.D., assistant professor of pediatrics, Cornell University Medical College, 50 East 72nd St., New York.

Clyde Schuman, nutrition director, American Red Cross, Washington, D. C.

Henry L. K. Shaw, M.D., clinical professor of pediatrics, Albany Medical College, 142 Washington Ave., Albany, N. Y.

Mrs. F. Louis Slade, New York League of Women Voters, 49 East 67th St., New York.

Richard M. Smith, M.D., assistant professor of child hygiene, Harvard University Medical School, 66 Commonwealth Ave., Boston.

Mrs. Berthold Strauss, vice president, Community Health Center, Philadelphia, 421 Ashbourne Rd., Elkins Park, Pa.

Edward A. Strecker, M.D., professor nervous and mental diseases, Jefferson Medical College of Philadelphia, 345 South 19th St., Philadelphia.

Douglas A. Thom, M.D., director, division of mental hygiene, Massachusetts Department of Mental Diseases, 520 Commonwealth Ave., Boston.

Katharine Tucker, R.N., general director, National Organization for Public Health Nursing, 370 Seventh Ave., New York.

Philip Van Ingen, M.D., clinical professor, diseases of children, College of Physicians and Surgeons, Columbia University, 125 East 71st St., New York.

Borden S. Veeder, M.D., professor, clinical pediatrics, Washington University School of Medicine, 3720 Washington Blvd., St. Louis.

William Weston, M.D., chairman, section on diseases of children, American Medical Association, 1428 Lady St., Columbia, S. C.

Herbert B. Wilcox, M.D., Carpentier professor, diseases of children, Columbia University College of Physicians and Surgeons, 39 East 75th St., New York.

LeRoy A. Wilkes, M.D., director, Medical Service, American Child Health Association, 370 Seventh Ave., New York.

Others may be asked to join the committee as work progresses.

It is interesting to note that of the seventy-two persons on the committee, thirty-nine are practicing physicians, and eight others have the degrees of M.D. There are also four members of the dental profession.

The distribution of the committee by states is as follows: California 3, Colorado 1, District of Columbia 5, Georgia 1, Illinois 7, Iowa 1, Louisiana 1, Maryland 3, Massachusetts 11, Michigan 1, Minnesota 4, Missouri 4, New Jersey 1, New York 16, North Carolina 2, Ohio 1, Pennsylvania 8, South Carolina 1 and Virginia 1.

Boston Floating Hospital Given $200,000 by Jackson Trust.—The Boston Floating Hospital, the boat home of which was burned in Boston Harbor in 1927, has received a gift of $200,000 from the Jackson Trust for the erection of a hospital building to be a part of the newly formed New England Medical Center.

Bequests and Donations.—The Babies' Hospital, New York, received a bequest of $10,000 from the will of the late Edwin C. Moller.

The New York Foundling Hospital received a bequest of $50,000 by the will of the late Conrad Hubert, and $10,000 by the will of the late Samuel Stern.

The Home for Destitute Crippled Children, Chicago, received $20,000 from the will of the late Andrew Klor.

International Congress of Pediatrics.—All titles and résumés of manuscripts to be presented at the International Congress of Pediatrics at Stockholm, August 17-20, must be in the hands of the American Committee for decision on or before March 1. For the sake of expediting work along these lines, the Committee has been divided as follows: north Atlantic and central states (north of Virginia and east of the Alleghanies), Dr. A. F. Hess, 16 W. 86th St., New York, Dr. Kenneth Blackfan, Children's Hospital, 300 Longwood Ave., Boston, and Dr. Edwards A. Park, Johns Hopkins Hospital, Baltimore; southern section, including the southern states west of the Mississippi (Mo., Ark., Okla. and Texas), Dr. Hugh McCulloch, 500 South Kingshighway, St. Louis, Mo., and William Weston, Columbia, S. C.; the middle west: Dr. Clifford G. Grulee, 310 South Michigan Ave., Chicago, Dr. Julius H. Hess, 104 South Michigan Ave., Chicago, Dr. H. F. Helmholz, Mayo Clinic, Rochester, Minn., and Dr. C. A. Aldrich, 723 Elm St., Winnetka, Ill.; Rocky Mountain and Pacific states, Dr. William Palmer Lucas, University of California Medical School, Parnassus and 3rd Aves., San Francisco.

It should be definitely understood that all papers to be read before the Congress by pediatricians from the United States must be approved by the American Committee by March 1, according to the instructions received from Stockholm.

DEATHS

Prof. Carlo Francioni, royal professor of pediatrics at the University of Bologna, recently died at Bologna, at the age of 53. Dr. Francioni was one of the best known of Italian pediatricians. He had previously been professor of pediatrics at the University of Florence. He was a pupil of Mya. He left Florence in 1915 to take over the professorship at Bologna.

Dr. D. Patricio Borobio, dean of the medical faculty and professor of diseases of children at the University of Saragosa, has recently died. He was one of the most eminent of Spanish pediatricians and his death is to be greatly lamented.

Dr. E. C. Carr, of Coshocton, Ohio, one of the original members of the Central States Pediatric Society died on January 5 of carcinoma of the face, at the age of 79.

UNIVERSITY NEWS

Recently at Florence, Prof. Carlo Comba was given special recognition by his friends and colleagues of that city on the commemoration of the twenty-fifth year of his professorship.

Owing to the recent death of Prof. Carlo Francioni, head of the department of pediatrics in the medical school of the University of Bologna, the following changes have taken place: Prof. Maurizio Pincherle from the University of Pavia has taken the chair at Bologna; Prof. Gino Frontali of the University of Cagliari has taken the chair at Pavia; Prof. Giuseppe Macciotta of the University of Perugia has taken the chair at Cagliari, and Prof. Vittore Zamorani, assistant in the Pediatric School at Genoa has been given the chair at Perugia.

SOCIETY NEWS

Philadelphia Pediatric Society.—To stimulate interest in pediatrics, the Philadelphia Pediatric Society announces a competition for practitioners of less than six years since graduation who live in the Philadelphia area. The prizes will be $100 and $50, and the investigations and studies must be limited to pediatrics.

Abstracts from Current Literature

Anatomy and Physiology

INNERVATION OF THYMUS. L. PINES and R. MAJMAN, J. Nerv. & Ment. Dis. **69**:361 (April) 1929.

The authors, using the Cajal silver impregnation methods of staining sections of the thymus, have found nerve bundles entering the gland and ramifying between lobules, through the interstitial tissue. These nerve bundles were found escorting the vessels at a great distance, forming nerve plexuses, one type in the adventitia, the other in the tunica media. The latter plexuses contain the vasomotor nerves. They found terminal nerve apparatus of an ovoid or bulblike shape in the connective tissue between the lobules. These were considered as primitive receptive organs. The fibers are thicker than the vascular nerve fibers and do not show any varicosity. Nerve fibers were seen to penetrate into the lymphoid lobule and spread diffusely throughout the parenchyma, with lateral branches and terminal ramifications which end with small knobs adjacent to the cells. They identify a pericorpuscular innervation in Hassel's corpuscles in which the nerve fiber surrounds the corpuscle outward or by terminal ovoid-like thickenings. Sympathetic ganglion cells in the thymus gland were not observed. The authors conclude that the thymus is well supplied with differentiated sympathetic and cerebrospinal nerves, both afferent and efferent, and that all the elements of the gland are under nerve control.

HART, Greenwich, Conn.

WEIGHTS OF HEARTS OF FETAL AND NEWLY-BORN ANIMALS. M. S. PEMBREY, J. Physiol. (Proc. Physiological Soc.) **66**: (Nov.) 1928.

Differences in the weights of the left and the right ventricles in the rabbit, cat, dog, guinea-pig and man appear to be related to the immaturity or maturity of the animals at birth. The capacity for muscular coordination and work is a biologic measurement; weight of body is not. There are large individual variations which should be considered as physiologic and related to adaptation. The differences in the work of the two sides of the heart before and after birth may not be the sole factor.

KUGELMASS, New York.

Pathology, Bacteriology and Biochemistry

THE EFFECT OF ADMINISTRATION OF EXCESSIVE AMOUNTS OF WATER: III. THE VOLUME AND COMPOSITION OF THE BILE. A. M. SNELL and L. G. ROWNTREE, Am. J. Physiol. **85**:577 (July) 1928.

The production of water intoxication in dogs with permanent biliary fistulas causes a diminution in the total output of bile and a still more marked reduction in bile acids out of proportion to the bile and bilirubin. The duration and extent of this diminution depend on the condition of the animal. Half the quantity of water required for intoxication has practically no effect, except in unfit animals. These effects are attributed to "water-logging" of the liver.

KUGELMASS, New York.

THE TOXIC FACTOR IN BILE. O. H. HORRALL and A. J. CARLSON, Am. J. Physiol. **85**:591 (July) 1928.

Bile is toxic when injected intraperitoneally, subcutaneously or intravenously. This action is not affected by the presence or absence of bacteria, nor is it modified by boiling or freezing. Bilirubin is nontoxic as are the pure bile acids on account of their insolubility. Bile dialysate is a toxic as whole bile, the nondialysable

portion being nontoxic. The action is located in the cholate portion of the bile salts. The symptoms are general throughout the body, and may be due to the solvent action of the bile salts on the limiting membranes of tissue cells.

KUGELMASS, New York.

THE CHOLESTEROL CONTENT OF NORMAL TISSUES AND THE EFFECT OF INTRAVENOUS INJECTIONS OF CHOLESTEROL THEREON. E. N. CHAMBERLAIN, J. Physiol. **66**:249 (Nov.) 1928.

The cholesterol content of the suprarenal glands, spleen, brain, liver, kidneys, lungs, muscle and blood in normal buck rabbits was estimated by Grigaut's method; the color reaction used was that of Liebermann and Burchard. Leiboff's method was used in most cases for whole blood. The brain and suprarenal glands contain respectively an average percentage of 1.8 and 7.3 Gm.; the spleen, liver, kidneys and lungs contain between 300 and 500 mg. per hundred cubic centimeters; blood contains 78 mg. and muscle 64 mg. per hundred cubic centimeters. The great variations in the amount of cholesterol in the suprarenal glands indicate some special physiologic activity (synthesis). Intravenous injections (a special emulsion, from 2 to 7 cc. of 4 per cent cholesterol) caused a definite hypercholesterinemia (a 50 per cent increase); cholesterol was rapidly removed from circulation; the suprarenal glands showed no increase, but a definite decrease; the spleen showed a marked increase for its weight more than any other organ; the liver absorbed a small amount, but the lungs, kidneys, brain and muscle showed no appreciable change after the intravenous injection of cholesterol; no variation of less than 20 per cent has been account of any significance in framing the foregoing conclusions.

KUGELMASS, New York.

SOME ASPECTS OF THE VAN DEN BERGH TEST FOR BILIRUBIN. J. P. M'GOWAN, Edinburgh M. J. **36**:242 (April) 1929.

M'Gowan, of the Rowett Research Institute, Aberdeen, discusses factors inherent in the reagents which influence the van den Bergh test. He comes to the conclusion that bilirubin is chemically the same whether it comes from obstructive or hemolytic jaundice; however, there is a difference in the buffer reserve of the blood serum, which under the most favorable circumstances may make it possible to tell which type of jaundice exists. The occurrence of indeterminate results is common whereby obstructive jaundice may be wrongly considered as hemolytic. When there is little bilirubin present in the serum the type is easily missed.

NEFF, Kansas City, Mo.

THE AGGLUTINATING ACTION OF HUMAN BLOOD SERUM UPON B. ABORTUS (BANG): A PRELIMINARY COMMUNICATION. CECIL I. B. VOGE, Edinburgh M. J. **36**:249 (April) 1929.

Voge, a Carnegie scholar in the Animal Breeding Research Department, Edinburgh, emphasizes the fact that the cow may have no symptoms for several months at the beginning of infection, abortion being the first manifestation and one that is sometimes overlooked. The bacilli are present in the milk from one and one-half to four months after the abortion. The author doubts that the pathogenicity of the organism or the connection between Malta fever and contagious abortion is as yet proved.

In this paper are reported the results of agglutination tests on human serum, *B. abortus* being the antigen. The tests gave positive results in 6 per cent of cases, the serum being obtained chiefly from syphilitic patients; this showed that serum can agglutinate the bacillus independently of syphilitic infection.

NEFF, Kansas City, Mo.

ON THE DETERMINATION OF FREE PHOSPHATES IN SMALL QUANTITIES OF BLOOD SERUM. H. MAGNUSSON and H. SYLVAN, Acta paediat. **9**:9, 1929.

After reviewing the limitations of the various methods for inorganic phosphates, the authors present a microtechnic based on colorimetric principles and similar to the method of Kuttner and Cohen, requiring only 0.1 cc. of serum, obtained from 0.2 or 0.3 cc. of whole blood. It appears to have an error of only 2 or 3 per cent.

McINTOSH, Baltimore.

APPEARANCE OF BASOPHILIC GRANULAR ERYTHROCYTES. B. SHIROYA, J. Pediat. (Tokyo), July 20, 1929, no. 350, p. 1171.

The author reports the appearance of basophilic granular erythrocytes in 180 patients of all ages, but particularly in the young, and notes their presence in 100 per cent of normal healthy persons. The presence of the cells is more noticeable in young girls during and immediately after menstruation. According to the author, their presence in the peripheral blood is, therefore, a normal condition and is not limited to such pathologic conditions as lead poisoning or anemia, as is commonly supposed.

KATO, Los Angeles.

PRESENCE OF BASOPHILIC GRANULAR ERYTHROCYTES IN INFANTS. H. SUGITA and S. MATSUSHITA, J. Pediat. (Tokyo), July 29, 1929, no. 350, p. 1185.

The authors found the presence of basophilic granular erythrocytes in only eighteen of 291 infants examined (6.52 per cent). These cells occur in a higher percentage among anemic and pale infants than in babies of normal color. The presence of these cells is noted more frequently during the first twelve months of life than in later years.

KATO, Los Angeles.

A STUDY OF BODY TEMPERATURE OF NORMAL INFANTS. SONOSUKE HAMADA, J. Pediat. (Tokyo), Aug. 20, 1929, no. 351, p. 1299.

The author made observations on normal variations in temperature in several normal infants in Nagasaki. He found that the average axillary temperature was 36.51 C. (97.72 F.). The new-born infants show a rise of temperature in from two to three days after birth, and a fall in from four to six days but again a rise on the seventh day. In the new-born, the temperature is at its maximum in the morning, while during the day it is the lowest; the evening shows intermediate figures. In the new-born male infants the average temperature was 36.58 C. (97.84 F.), and in the female 36.38 C. (97.48 F.). The well nourished infants show higher temperature at birth than do the malnourished infants. In the older infants (from 1 to 10 months of age) the average temperature was 36.51 C. During the first four months of life, the temperature is higher than during the months between the sixth and the ninth, but it rises again somewhat at the tenth month. There is practically no difference between the temperature of the male and the female infants at this age. The temperature rises at 8 a. m. and gradually increases till 6 p. m., when it begins to decrease, showing the lowest at from 12 m. to 2 a. m. The variation is at its maximum during the summer months. The method of feeding and the degree of nutrition seemed to have no relation to body temperature. Immediately after bathing the temperature shows a rise of from 0.3 to 1.1 C. (5.4 to 1.98 F.). Immediately after feeding, it rises to 0.12 C. (0.21 F.). Atmospheric variation has a slight influence on body temperature. The rectal temperature is about 0.38 C. (0.68 F.) higher than the axillary.

KATO, Los Angeles.

EXPERIMENTAL STUDY OF THE REMOVAL OF THE HYPOPHYSIS AND THE ACTION OF ANTERIOR PITUITARY EXTRACT IN ALBINO RATS. Y. KOYAMA, J. Pediat. (Tokyo), Aug. 20, 1929, no. 351, p. 1337.

The author used young albino rats, aged from 3 to 6 weeks. The method he devised was that of aspiration by a modified spinal puncture needle which he

introduced into the sella turcica by way of the middle ear. The symptoms of extirpation appeared one week after the operation. The animals showed a stationary growth and the power of resistance was greatly weakened. The body length did not increase; it was one-half to two-sevenths of the length of animals of the same weight that were not operated on. In females, the vaginal orifice remains tightly closed and in the males the testicles can not be felt in the scrotum. In both secondary sex characteristics did not appear. Death usually took place in from 50 to 100 days after operation. A necropsy study revealed that the animals from which the gland was removed showed the constant atrophy of ovaries and testicles. The brain was found to be normal in size. Extract of the pituitary gland (anterior lobe) of the ox, made by maceration of the tissue and by removal of protein materials by precipitation with alkali and acid, when injected into the operated animals had a beneficial effect on the growth of the body in weight and length and on the development of sexual functions.

KATO, Los Angeles.

Nutrition

THE SITTING HEIGHT AS A GUIDE TO THE PROPER WEIGHT OF AN INFANT. MANUEL M. GLAZIER, New England J. M. **201**:883 (Oct. 31) 1929.

The observations of the author are based on the "nem" system formulated by Pirquet. He believes that the use of the sitting height as a guide to development is more scientific than the use of the weight and age of an infant, since weight is only a sign of nutrition. He suggests that the proper weight of an infant can be calculated by the use of its sitting height (Si) in centimeters, as given in the accompanying table.

Age of Infant	Weight, Pounds
1 to 2 months	$\frac{Si \times Si}{150}$
3 to 6 months	$\frac{Si \times Si}{125}$
7 to 12 months	$\frac{Si \times Si}{100}$

Among 120 infants studied consecutively in the Boston Dispensary Clinic, 70 (58 per cent) had an actual weight within 10 per cent of their proper weight as calculated from the formulas given. Every infant in the group with actual weight differing markedly from calculated weight showed a tendency to approach the calculated weight under treatment.

GENGENBACH, Denver.

STUDIES ON COLOR TESTS FOR STEROLS AND FOR VITAMIN A: II. A SPECTROSCOPIC STUDY OF THE COLOURATIONS ATTRIBUTED TO VITAMIN A. F. WOKES, Biochem. J. **22**:997, 1928.

A quartz spectrograph was standardized by means of the mercury spectrum. For the study of the absorption bands of the vitamin A colors an iron nickel arc was used, the oil being placed in a quartz cell from 0.5 to 2 mm. thick and 20 mm. in diameter. With arsenic chloride the colors were examined within thirty to forty seconds of mixing; the mixture was constantly renewed in order to obtain the necessary photographs, as the colors fade quickly. The initial band was found at 587 millimicrons (mean), and a secondary band developed at 475 millimicrons. With antimony trichloride the colors are fairly stable, provided all the reagents are dry. The initial band is at 614 millimicrons and is very sharp; the secondary is at 530 millimicrons. By comparative measurements it was shown that as the band at 614 microns disappeared, the one at 530 millimicrons increased in strength. Various cod liver oils and concentrates were used for the tests.

KUGELMASS, New York.

THE ASSAY OF VITAMIN A. KATHERINE H. COWARD and KATHLEEN M. KEY, Bioch. J. **22**:1019, 1928.

Examples are given of a type of response of rats depleted of their stores of vitamin A to small doses of the vitamin. There is an immediate resumption of

growth, but at a subnormal rate and graded according to the dose given. The subnormal rate continues for many weeks, even until maturity, without any premature slackening. Sometimes animals fail to respond to the dose given for several weeks, and then show resumption of normal growth.

KUGELMASS, New York.

THE COLOUR REACTIONS OF SUBSTANCES CONTAINING VITAMIN D. W. A. SEXTON, Biochem. J. **22**:1133, 1928.

On mixing cod liver oil with aniline hydrochloride in excess aniline (redistilled aniline 5: concentrated hydrochloric acid 1) a green color is produced; after boiling for one-half minute and allowing the layers to separate, the lower layer gives an intense red color. A similar color is given by viosterol, and by ketones of the sterol group which contain one double band; the saturated ketones react less strongly, and the hydrocarbons and cholesterol, etc., fail to give the reaction. The color is also given by the unsaturated terpene ketone, carvone. Bezssonoff's phosphomolybdotungstic acid gives a color with cod liver oil, but not with viosterol. Hence, neither test is a specific for vitamin D.

KUGELMASS, New York.

THE MINIMUM AMOUNT OF VITAMIN D REQUIRED FOR A POSITIVE ANTIRACHITIC EFFECT IN THE "LINE" TEST. KATHERINE H. COWARD, Biochem. J. **22**:1221, 1928.

With rats on Steenbock and Black's rachitogenic diet and a sample of irradiated ergosterol of maximum potency prepared by Webster it was found that 2×10^{-5} mg. daily gave a good "line" of calcification, the range from initiation to complete healing being from 5×10^{-6} to 1×10^{-4} mg. Assuming that the irradiated ergosterol contains only 10 per cent, or less of vitamin D, this result indicates that the total amount of vitamin (consumed in ten days) necessary to give a positive test is 2×10^{-5} mg. This figure agrees exactly with Fosbinder, Daniells and Steenbock's (J. Am. Chem. Soc. **50**:923, 1928) estimate of the amount necessary, calculated from the quantity of energy of wave length 265 microns absorbed by a sample of "pure" cholesterol when the minimum detectable amount of vitamin was produced.

KUGELMASS, New York.

THE THERAPEUTIC VALUE OF IRRADIATED MILK IN THE TREATMENT OF RICKETS. CHALMERS WATSON and T. Y. FINLAY, Lancet **2**:704 (Oct. 5) 1929.

Both the Scholl and Scheidt methods of irradiation of milk were used, with apparently equally favorable results. From their study the authors are convinced that irradiated milk is of value in the prevention and cure of rickets.

LANGMANN, New York.

THE GROWTH AND MAINTENANCE OF WHITE MICE FED UPON SYNTHETIC DIETS. M. C. DAWBARN, Australian J. Exper. Biol. & M. Sc. **5**:149, 1928.

Male white mice grew normally for three successive generations on the following diet: casein, 18 parts; dextrinized arrowroot starch, 46 parts; sucrose, 15 parts; clarified butter fat, 8 parts; lard, 7 parts; salts, 4 parts, and moist yeast, 15 parts. The diet was less satisfactory for the growth and maintenance of female mice; the superior growth of females on a natural diet does not depend on the protein, salt or vitamin D content of the latter, but may depend on the superior content of vitamins A or B, or both. The investigation led to the view that a perfectly satisfactory diet for mice might be obtained by substituting in the aforementioned diet a hydrogenated vegetable fat and cod liver oil as the source of fat, and fat-soluble vitamins in the place of the mixture of lard and butter fat.

KUGELMASS, New York.

A Classification of Nutritional Disturbances in Infants. L. Gonzaga, Arch. de pediat., Rio de Janeiro **2**:403 (Sept.) 1929.

Nutritional disturbances in infants are divided into three groups. The first, which is due to frank nutritional disturbances, contains dyspepsia, decomposition and intoxication. The second group consists of the diatheses — exudative, neuropathic, thymolymphatic, and spasmophilic. The third contains the infections, such as parenteritis, gastro-enteritis, and dysentery.

Sanford, Chicago.

Digestive Disturbances Due to Avitaminosis as a Contributing Factor in Urinary Disturbances in Children. C. F. de Abreu, Arch. de pediat., Rio de Janeiro **2**:410 (Sept.) 1929.

The author believes that faulty digestion, particularly those disturbances due to a lack of vitamins, may be at least a decisive contributing factor in urinary disturbances. He gives eight cases in infants as illustrations, in which the patients recovered promptly on making up this deficiency.

Sanford, Chicago.

The Use of Irradiated Substances in the Therapeutics of Childhood. Juan A. Collazo, Arch. latino-am. de pediat. **23**:440 (June) 1929.

The author sums up his review under five headings:

1. Antirachitic activity: There exists no standard among the various activated commercial preparations. The antirachitic activity varies with the content of ergosterol and with the time and distance of the irradiation. Reliable preparations never fail experimentally or therapeutically.

2. Toxicity: Irradiated ergosterol may be a dangerous substance if used too freely and uncontrolled by a physician. Hyperphosphatemia, hyperazotemia, albuminuria, cylindruria and rapid ossification of the bones may occur.

3. Dosage: In the infant, it should not exceed from 3 to 5 mg. daily. This is equivalent to from five to ten drops in twenty-four hours. A safe average dose would be from 2 to 4 mg.

4. Control: Roentgenologic control is the only safe control for irradiated products.

5. The dosage of ergosterine should be rigidly controlled.

In irradiated foods, notably in milk, the amount of irradiated ergosterol varies. For this reason, such substances are not as certain in effect as is pure ergosterol in oil solution irradiated under perfectly controlled conditions. No elimination of ingested ergosterine has been observed.

Schlutz, Minneapolis.

Water Excretion in the Child. A. Bratusch-Marrain, Arch. f. Kinderh. **87**:81 (May) 1929.

In cases of dyspepsia the water excretion is similar to that of a normal child. An exception is in the giving of a protein-rich diet. Here the removal of water occurs by an extrarenal as well as by a renal route. Enterocatarrh also causes a water excretory separation, in which the extrarenal secretion is greater than the renal. An exception to this occurs in cases of extreme diarrhea which the extrarenal function is less. This often compensates for the water lost through the intestine in this condition. Intoxication shows a similar stimulation of the extrarenal function.

Sanford, Chicago.

Treatment with Irradiated Ergosterol for Rickets. A. Aurnhammer and A. Kollmann, Arch. f. Kinderh. **87**:138 (May) 1929.

Studies were made with irradiated ergosterol. The prophylactic dose was found to be 2 mg. per twenty-four hours. This will protect the majority of children from rickets. Seventy-three children with active cases of rickets showed

definite improvement in twenty-six days. Twenty-five cases of active or latent tetany showed definite improvement in twelve days. The principal complications in these cases of rickets were bronchopneumonia, pyelitis and intoxication. These complications were visibly lessened under treatment with irradiated ergosterol.

SANFORD, Chicago.

THE EFFECT OF DIET ON MINERAL METABOLISM IN INFANTS. F. BOLDT, C. BRAHM and G. ANDRESEN, Arch. f. Kinderh. **87**:277 (June) 1929.

The authors studied the mineral metabolism of two normal infants for three months in the following manner. During the first month they were kept on a low mineral diet by being fed mother's milk. The second month they were kept on a high mineral diet by being fed cow's milk to which 5 per cent dextrose was added, and the third month they were returned to mother's milk. The method of Romminger and Meyer was used to determine the amount of mineral matter eliminated. For the first month, the first infant on a low mineral diet excreted 1.79 Gm., and the second infant 2.25 Gm. The second month on the high mineral diet the first infant excreted 8.55 Gm. and the second excreted 8.83 Gm. The third month on a return to a low mineral diet the first infant excreted 1.829 Gm. and the second infant 1.742 Gm. The authors argue that if the mineral matter retained when the infants were on a high mineral diet was a simple retention and not an assimilation, it would be eliminated during the subsequent period when the infants were on a low mineral diet. If on the contrary, the mineral matter ingested during the period when the infants were on a high mineral diet was actually assimilated, the amount eliminated during the subsequent period when the infants were on a diet with a low mineral content would correspond to the amount eliminated by a normal breast-fed infant. According to this reasoning, the results showed that the mineral matter was assimilated.

SANFORD, Chicago.

VOMITING IN INFANCY. ALOIS BRATUSCH-MARRAIN, Mitt. d. Volksgesundheitsamtes, January, 1929, no. 1.

The author distinguishes between two groups of vomiting. The first he designates as symptomatic; in this group he includes the vomiting in acute nutritional disturbances, whooping cough, and the different forms of meningitis. The second he designates as essential vomiting, and considers under this group the so-called habitual vomiting, pylorospasm and stenosis or atresia of the intestinal tract. The author considered the diagnosis in both groups and the treatment in the latter group.

LESLIE, Evanston, Ill.

THE DOSAGE OF IRRADIATED ERGOSTEROL. W. CATEL, Monatschr. f. Kinderh. **45**:97 (Oct.) 1929.

The usual dose of irradiated ergosterol is from 2 to 4 mg. a day. The injuries from this dose reported by Goldschmidt led György to further experiments. He concluded that 1 mg. a day was sufficient. The author undertook further investigations. He used a 0.2 per cent solution of irradiated ergosterol; for a therapeutic index he estimated the blood phosphorus and calcium and made clinical and roentgenologic observations. He concludes that instead of the usual dose of irradiated ergosterol, 0.5 mg., or from 6 to 8 drops, are sufficient to give a decided therapeutic result in a case of florid rickets.

GERSTLEY, Chicago.

EXCRETION AND USE OF VITAMIN D. FRANZ HEPNER, Monatschr. f. Kinderh. **45**:116 (Oct.) 1929.

To determine the path of excretion of vitamin D the writer performed the following experiments. Rats were placed on a rachitic diet. A dog was fed 100 cc. of 1 per cent irradiated ergosterol during seven days. Then the dog's

gallbladder was punctured and 0.2 cc. of bile was fed to rats daily. This had the property of preventing rickets.

In another experiment the writer placed rats on a rachitic diet and fed them in addition powdered new-born chicks. These rats continued to develop severe rickets. Yolk of egg protected rats on this diet against rickets. Hepner concludes that the chick developing in the egg consumes all of the vitamin D available.

GERSTLEY, Chicago.

THE DOSAGE OF IRRADIATED ERGOSTEROL. A. KOLLMANN, München. med. Wchnschr. **76**:961 (June 7) 1929.

The dosage of irradiated ergosterol which has been recommended varies from 2 to 10 mg. per day. In some cases it is decreased gradually after the first week. During intercurrent infections the dosage is frequently increased to satisfy the greater need for vitamins during such infections. The dosage has no relation to the age or weight of the infant, but, according to Vollmer, bears a relation to the rate of growth. Kollmann treated seventy-three patients with florid rickets during the winter months with a uniform dosage of 2 mg. of irradiated ergosterol daily. Many of the patients had intercurrent infections. However, the average time for healing, as shown by clinical examination and roentgenogram, was 26.1 days. Kollmann found this simplified uniform dosage equally satisfactory for children in the second year as for infants from 2 to 3 months of age.

BRAHDY, Mount Vernon, N. Y.

THE DOGMA OF FIVE FEEDINGS FOR INFANTS. W. STOELTZNER, München. med. Wchnschr. **76**:1561 (Sept. 13) 1929.

Stoeltzner strongly objects to the dogmatic practice of feeding infants five times in twenty-four hours. Some will thrive on less than five feedings, but many will not do well unless given from six to ten feedings a day. Thirty years ago, the problem in Germany was to prevent overfeeding; today there is a tendency to undernourish infants.

BRAHDY, Mount Vernon, N. Y.

THE THERAPEUTIC USE OF HUMAN MILK. A. REUSS, Wien. klin. Wchnschr. **42**:1183 (Sept. 12) 1929.

Attention is called to methods of modifying human milk so as to make it meet a great variety of indications in the treatment of sick infants. The author writes this article as a protest against the statement recently uttered by a colleague that "the fatalistic retreat to the use of human milk is in the last analysis an admission of the bankruptcy of the theory of infant feeding."

CLAUSEN, Rochester, N. Y.

THE GROWTH-PROMOTING RAYS. G. POLITZER, Wien. klin. Wchnschr. **42**:1277 (Oct. 3) 1929.

An exposition of the experiments of Gurewitsch (Das Problem der Zellteilung, Berlin, Julius Springer, 1926) and of Reiter and Gábor (Zellteilung und Strahlung, Berlin, Julius Springer, 1928). These authors believe that (1) multiplying cells emit electromagnetic waves, 200 (Gurewitsch) or 340 millimicrons (Reiter and Gábor) in length, and (2) electromagnetic waves of these lengths can induce cell division. As the source of the "radiation" they used the growing root-tip or a suspension of the hashed "sole" of the onion; as a test object, they used a rootlet of the onion. The effect is judged by the number of mitotic figures observed in the portion of the rootlet exposed to the "radiation." That the agency in question is radiation is indicated by the following facts: It is propagated in straight lines; it transverses quartz and thin layers of glass; it may be reflected from polished surfaces; its direction is changed on passing from air into glass or water. (The

degree of refraction permits an estimate of the wavelength.) When radiation of the calculated wavelength from an artificial source is used, similar growth-promoting effects are observed in the test object. Radiation of wave-length between 280 and 340 millimicrons in itself is ineffective; but when combined with the growth-promoting rays, prevents their action.

The experiments, if acceptable, would establish the contentions of Gurewitsch. The discovery would have important bearing on many physiologic and pathologic types of growth and on the inhibition of growth. The author fails to allude to the storm of criticism directed against these views.

CLAUSEN, Rochester, N. Y.

IRRADIATED MILK IN TREATMENT FOR RICKETS. A. BRATUSCH-MARRAIN and J. SIEGL, Wien. klin. Wchnschr. **42**:1279 (Oct. 3) 1929.

The authors state that the disagreeable qualities imparted to milk by irradiation in air are absent when the irradiation is carried out in carbon dioxide. Eight children with rickets who received no other antirachitic food than irradiated milk recovered completely in seven or eight weeks. One control remained rachitic; the only other control improved slowly, but not completely. The only criteria of cure were clinical observations and roentgen observations; no analyses were made of the serum for phosphate or calcium. The authors feel that viosterol is not safe. They do not mention cod liver oil.

CLAUSEN, Rochester, N. Y.

THE VITAMIN CONTENT OF YEAST. E. MAURER, Ztschr. f. Kinderh. **47**:202, 1929.

Yeast, in consideration of its extraordinarily rich content of vitamin, takes an outstanding place in the series of worthwhile elements for human nutrition, and its significance is still further increased, according to Voeltz and Baudrexl, in that because of its high physiologic efficiency it belongs to the food elements which are most concentrated and richest in protein.

EMERSON, Boston.

THE PHOSPHATE CONTENT OF CORD BLOOD AFTER ANTIRACHITIC TREATMENT OF THE MOTHER. I. JUNDELL and H. MAGNUSSON, Acta paediat. **9**:81, 1929.

Pregnant women were given cod liver oil with phosphorus for from four to twenty-one weeks before confinement, and the serum inorganic phosphate of the cord blood was determined at the time of delivery. The total amount of cod liver oil taken by individuals varied from 300 to 2,850 Gm. As controls, an equal number of women were chosen who had had no similar antirachitic treatment, and the attempt was made to select patients who were delivered as nearly as possible on the same day as were the patients taking cod liver oil, in order to obviate confusion from seasonal variation of serum phosphate level. The fetal serum phosphate averaged 5.39 mg. per hundred cubic centimeters in the patients treated with cod liver oil, or 0.77 mg. more than in the controls. A similar experiment in which viosterol was given is less convincing, because of both the smaller change and the smaller series of cases.

MCINTOSH, Baltimore.

Prenatal Conditions

CONGENITAL ABSENCE OF THE CLAVICLES (HEREDITARY CLEIDOCRANIAL DYSTOSIS): REPORT OF A CASE. H. C. PILLSBURY, Am. J. Roentgenol. **18**:322 (Oct.) 1927.

This defect of which less than sixty cases have been reported is regarded by the French as a dystrophy because of the association of absence of clavicles, cranial malformations, disorders of dentition and heredity. Usually the suture lines remain depressed the lateral cranial diameter is increased and the fontanel closes late (in one case it remained the size of a palm until the age of 47). Primary teeth

persist to the age of 12; secondary dentition is incomplete, irregular and prone to caries. There are missing and supernumerary teeth. The condition usually includes several members of one generation, but to date only two successive generations have been traced. Clinically there is no deviation except the ability to pull the shoulders so far forward that the deltoid eminences touch without producing the slightest pain. In the reported case sternal fragments of both clavicles are present. A bibliography is included with the article.

STULIK, Chicago.

CONGENITAL VALVULAR OBSTRUCTION OF THE URETHRA. OSWALD ADDISON, Arch. Dis. Childhood **4**:255 (Oct.) 1929.

Three cases are reported in male children. There had been difficulty in micturition since birth. Later, continuous enuresis developed. The passage of bougies is an effective treatment.

PETERMAN, Milwaukee.

ABNORMALITY OF MESENTERY. J. WILKIE SCOTT, Proc. Roy. Med. Soc. **22**:1529 (Oct.) 1929.

A case of abnormality of the mesentery was reported in a girl aged 6 years. Since birth she had suffered from severe abdominal pain. Removal of the appendix had no effect on the attacks. A roentgenogram taken after a bismuth meal and enema was negative; when repeated, the roentgenogram suggested an abnormal position or mobility of the large intestine.

WILLIAMSON, New Orleans.

HYPERTROPHY OF THE LEG. J. WILKIE SCOTT, Proc. Roy. Soc. Med. **22**:1531 (Oct.) 1929.

A case of hypertrophy of the leg was reported in a boy aged 2 years. The right thigh was 1¾ inches (4.4 cm.) and the right leg also 1¾ inches larger in circumference than the left. The bones of right limb were thicker than those of left. The length of the bones was equal. Numerous nevoid areas were present on various parts of the body.

WILLIAMSON, New Orleans.

CONGENITAL SHORT NECK. J. WILKIE SCOTT, Proc. Roy. Med. Soc. **22**:1532 (Oct.) 1929.

A case of congenital short neck was reported in an infant aged 16 months. The head was fixed low between the shoulders. A roentgenogram showed close-set cervical vertebrae with prolonged transverse processes. The child was poorly nourished and mentally deficient; he suffered from cleft palate. He had no teeth and could take only liquid nourishment.

WILLIAMSON, New Orleans.

CONGENITAL COXA VARA. ÉTIENNE SORREL, Bull. Soc. de pédiat. de Paris **27**:220 (April) 1929.

A series of cases of coxa vara are described and a number of roentgenograms reproduced to show that the congenital type of coxa vara really represents the absence of development of the upper extremity of the femur. Coxa vara other than congenital is less common and is due to rickets, fracture of the neck of the femur (which is rare in children), tuberculosis and osteomyelitis of the neck of the femur. These all differ from the congenital form anatomically and symptomatically, and require different treatment.

BENJAMIN, Montreal.

CONGENITAL SCOLIOSIS. C. RŒDERER and H. DIJONNEAU, Paris méd. **19**:240 (Sept. 21) 1929.

The author divides congenital scoliosis into two groups. The first and rarest group is scoliosis without osseus anomaly. He gives as illustration the case of

a child, aged 6 months, in whom the condition was discovered when she first sat alone. A roentgenogram showed no anomaly, but the individual vertebrae were somewhat separated at the point of greatest curvature. The second group which comprises the more common observations he designates as congenital scoliosis with osseus anomaly. This is divided into one group of incomplete vertebral development, and another of spina bifida. Four cases of the first group and two of the second are given. Diagnosis is assured by the roentgenogram, and the treatment is obviously a repair of the cause if possible. Gymnastics and graded exercises are helpful.

SANFORD, Chicago.

UNUSUAL HEART ANOMALY. O. JAEGER, Beitr. z. path. Anat. u. z. allg. Pathol. **80**:29, 1928.

The author describes a heart obtained at necropsy from a girl, aged 9 months, and discusses the genesis of the anomaly in the light of the phylogenetic atavism theory propounded by Spitzer in 1923. The interventricular septum was defective. The right auriculoventricular valve was a typical mitral, the valve of the left side being a tricuspid the posterior segment of which was adherent to the posterior portion of the defective septum. The left, tricuspid valved ventricle gave rise to the aorta, situated to the left and the pulmonary artery, situated to he right. The ducus arteriosus was patent. In the features noted the heart was an example of the not uncommon type of dextroversion, inversion and transposition, which has formed the strongest support for Spitzer's theory. The unusual feature of the heart described consisted in the presence of chordae tendinae which ran from the posterior segment of the tricuspid valve, which was situated in the left sided ventricle, through the defect in the septum, to be inserted in a strong papillary muscle on the posterior wall of the right sided ventricle. The author believes that this papillary muscle was developed from the anlage of the posterior portion of the interventricular septum, the posterior portion of the existing septum having arisen from new formative tissue which began its development after the original septal anlage had begun to be transformed into papillary muscle. In this feature as well as in the other anomalies present, the author believes the heart to offer strong support for the Spitzer theory.

[ARCH. PATH.]

CONGENITAL DIAPHRAGMATIC DEFECT WITH UPWARD DYSTOPIA OF KIDNEY. H. O. KLEINE, Beitr. z. path. Anat. u. z. allg. Pathol. **80**:609, 1928.

The author presents an example of diaphragmatic defect in a female infant who lived twenty-four hours. The gastro-intestinal tract from stomach to sigmoid was situated in the left pleural cavity, as was also the spleen. The defect in the diaphragm was limited to the left side. The left suprarenal and the upper pole of the left kidney extended through the defect into the pleural cavity. Pleura and peritoneum were united at the margins of the defect. The misplaced abdominal organs were not covered by parietal peritoneum, the condition therefore not being one of true hernia. The right lung was compressed and atelectatic, the heart was pushed to the right and there was scoliosis of the thoracic vertebral column to the right. Foramen ovale and ductus arteriosus were patent. The fetal mobile mesocolon had persisted, resulting in a mesenterium commune, which permited the entire intestinal tract to enter the thoracic cavity. The dystopic kidney, however, was firmly attached to its underlying retroperitoneal tissue. The fetal kidney, in its normal ascent, reaches the diaphragm at or just before the time of closure of the pleuroperitoneal foramen. Kleine believes that a more rapid ascent of the kidney than normal prevented closure of the foramen and was the causative factor in the diaphragmatic defect. Ten previously reported cases of diaphragmatic defect with renal dystopia together with his case constitute a special group in which the renal dystopia was the cause of the defect. Persistence of the mesocolon may be the cause of the abnormal ascent of the kidney.

[ARCH. PATH.]

INTRAMESENTERIC MECKEL'S DIVERTICULUM SIMULATING REDUPLICATION OF THE ILEUM. L. KUGELMEIER, Beitr. z. path. Anat. u. z. allg. Pathol. **80**:682, 1928.

A girl, aged 5 months, who died of hemorrhage from a congenital ciliated cyst of the lung, had what appeared to be a longitudinal reduplication of the ileum. Beginning at a point 1.2 meters above the ileocecal valve was a tubular structure 50 cm. long. This was situated within the mesentery, its two-layered smooth muscle wall being in apposition with the muscle wall of the ileum. The structure ended blindly above, the blind end being somewhat dilated. No connection with the umbilicus could be detected. The microscopic structure was like that of the ileum. The author considers the structure described an unusually long Meckel's diverticulum, and believes that the small number of reported cases of longitudinal reduplication of the ileum are likewise examples of intramesenteric Meckel's diverticulum. (The abstractor has seen an exactly similar case of apparent reduplication of the ileum; this was held to be an unusually long Meckel's diverticulum.)

[ARCH. PATH.]

DEXTROVERSION, INVERSION AND TRANSPOSITION OF THE HEART. A. SPITZER, Virchows Arch. f. path. Anat. **271**:226, 1929.

Spitzer dedicates his seventy-eight page monograph to Professor Julius Tandler, the anatomist, in honor of the latter's sixtieth birthday. The article is based on a heart obtained from a boy who died at the age of 6 years and who had been cyanotic from birth. The first third is a minutely detailed description of the changes found, the remainder consisting of a discussion of the factors involved in the genesis of the malformation. The latter appeared at first glance to be a simple dextroversion, but closer study revealed that both inversion and transposition were concerned in bringing about the anomaly. The heart had a large, hypertrophied right ventricle with, however, a typical mitral valve. The left ventricle was small and had a typical tricuspid valve. The ventricular septum was defective, the defect beginning in the subaortic region and part of the margin of the defect being formed by the aorticopulmonic crest. The ductus Botalli was patent, and the foramen ovale was open. The smaller left ventricle (transposed right) gave rise to the aorta, which was situated to the left, and the pulmonary artery, which was to the right and was atretic in its intramuscular or conus portion. The malformation is discussed as a possible atavistic reversion to a stage in ontogenetic or phylogenetic development, and the relation of dextroversion, inversion and transposition to each other and the possible combinations of these processes are elaborated in detail.

O. T. SCHULTZ.

CIRCULATORY SYSTEM OF DICEPHALIC MONSTER. OLGA SEAMON, Virchows Arch. f. path. Anat. **271**:512, 1929.

In the monstrosity studied, the heads were separate, the vertebral columns were separate down to the sacrum, the internal organs were duplicated with the exception of the urinary bladder and the two livers were fused. Especial attention was given to study of the circulatory system, since the heart of one-half was rudimentary and had no connection with the vascular system of its portion. The relations of the two circulatory systems are described in detail, and the embryogenesis of the cardiovascular anomaly is discussed.

O. T. SCHULTZ.

Diseases of the New-Born

THE ETIOLOGY OF STRIDOR CONGENITUS. CLAIRE BAGG, Monatschr. f. Kinderh. **45**:102 (Oct.) 1929.

The author gives a brief historical review of the subject, with extracts from the literature. Seven interesting case histories follow. Each of these patients had a stridor congenitus. The diagnoses, however, varied in the individual cases. In

the first, there was thymus hyperplasia; in the second and third, malformation of the epiglottis. In two cases the apparent cause was malformation of the lower jaw. One of the children suffered from macroglossia and one from a congenital goiter.

In all cases the stridor started immediately after birth and was essentially inspiratory. Five of the cases occurred in boys. This is contrary to the previous reports which show a greater frequency in girls. In the three cases followed, the stridor gradually disappeared. In the differential diagnosis, laryngospasm must be ruled out.

The treatment depends on the cause.

GERSTLEY, Chicago.

CHILDREN CRIPPLED BY BIRTH TRAUMA. MAX LANGE, München. med. Wchnschr. **76**:1211 (July 19) 1929.

Lange emphasizes some interesting points in his study of children crippled by birth injury who were admitted to the Orthopedic Hospital in Munich from 1921 to 1928. The cases are divided into four groups; spastic paralyses, paralyses of the arm (Erb), intra-uterine fractures and torticollis. There were 107 cases of spastic paralysis, 2 per cent of all admissions during that period. Deficient cerebral development and syphilis were carefully excluded. The unusual feature of this group was that 25 per cent of the deliveries were normal, and 20 per cent were premature. In the second group, consisting of flaccid paralyses of the arm, all the deliveries were difficult. Lange expresses his belief that many of these paralyses are due to an overstretching of the muscles rather than to a nerve injury. There was a total of fifteen cases; three were definitely due to nerve injury and one was the result of subluxation of the shoulder joint. Intra-uterine fractures had occurred in twelve cases. There were forty cases of torticollis in twenty of which the deliveries were normal; in eight forceps were used; nine were breech presentations, but in only two of the latter was there a swelling of the neck immediately after birth. This suggests that torticollis is not always due to birth injury. Infants born by cesarean section had fibrosis of the sternocleidomastoid muscle. Roentgen evidence of intra-uterine torticollis has been obtained. In summary Lange urges more careful obstetric technic, as half of the 143 children observed will remain crippled for life.

BRAHDY, Mount Vernon, N. Y.

TREATMENT FOR DEPRESSIONS OF THE SKULL IN THE NEW-BORN AND IN INFANTS. H. STEUDEL, München. med. Wchnschr. **76**:1379 (Aug. 16) 1929.

Steudel refers to a patient whom he treated thirty-five years ago for a depression of the skull. At 2 months of age the patient fell 5 feet to a hard floor. There was a temporal depression, 5 by 2.5 cm. and 2.5 cm. deep. The author improvised a suction apparatus and lifted the depressed portion to its normal position. Twenty-two years later the patient showed no physical defect and was a good mechanic, but according to the parents he was slightly retarded mentally. Steudel attributes the mental deficiency to the trauma.

BRAHDY, Mt. Vernon, N. Y.

SO-CALLED MELENA NEONATORUM. RICHARD BAYER, Ztschr. f. Kinderh. **47**: 276, 1929.

A baby boy vomited on the second day of life and passed bloody stools; despite treatment he died on the following day. At autopsy a duodenal ulcer, with thrombus formation at the base where two small arteries opened, and shallow erosions on the mucous membranes of the stomach were found.

EMERSON, Boston.

Acute Infections

DIPHTHERIA OF THE EAR. DAVID NUSSBAUM, Arch. Otolaryng. **10**:296 (Sept.) 1929.

A case of acute right otitis media is reported in which the drum was opened. A slight purulent discharge was obtained. About two days later a thick, white,

firmly adherent membrane was found on the ear drum. A little later a similar membrane was found in the right nasal chamber. Cultures from both were positive for diphtheria, and 10,000 units of diphtheria antitoxin were given. After twelve hours, improvement was progressive, so that in a few days the patient was normal.

BARNETT, Chicago.

THE CIRCULATORY FAILURE OF DIPHTHERIA: I. THE CLINICAL MANIFESTATIONS OF EARLY AND LATE FAILURE. FRANCIS F. SCHWENTKER and WILLIAM W. NOEL, Bull. Johns Hopkins Hosp. **45**:276 (Nov.) 1929.

These writers have studied the literature and analyzed thirty-nine cases of their own. They find that the deaths from circulatory failure fall into two groups; 48 per cent occur at the height of the diseases from the second and ninth day after onset, and 52 per cent fall between the ninth and forty-seventh days when convalescence has apparently set in. They believe that these cases of early and late heart failure have a separate mechanism and etiology. The changes in early heart failure are due to the degenerative action of the toxin on the heart muscle. In patients dying of late cardiac failure the changes are caused by local inflammatory reactions incident to regeneration and repair.

The accompanying table shows the basis of differentiation of these two types.

Early Circulatory Failure	Late Circulatory Failure
Onset from second to ninth day	Onset from seventh to fiftieth day
Onset gradual	Onset sudden
Previous course progressively downhill	Previous course usually convalescent
Patient quiet	Patient restless
Temperature elevated	Temperature normal
Vomiting rare	Vomiting usual
Abdominal pain seldom	Abdominal pain usual
Liver enlarged often	Liver usually enlarged
No cardiac enlargement	Cardiac dilatation often
Tachycardia	Tachycardia or bradycardia
Heart sounds loud	Heart sounds soft
Arrhythmia terminal	Arrhythmia usual and introductory
Normal blood pressure	Progressive hypotension
Conducting system symptoms seldom seen	Conduction system symptoms often seen
Protodiastolic gallop, terminal	Protodiastolic gallop usual
Electrocardiogram normal	Electrocardiogram abnormal
Recovery of cardiac reserve always complete	Recovery of cardiac reserve usually complete

Treatment will be considered in a later paper.

LYTTLE, New York.

THE NERVOUS COMPLICATIONS OF WHOOPING COUGH. W. GORDON SEARS, Brit. J. Child. Dis. **26**:178 (July-Sept.) 1929.

Instances of cerebral hemorrhage and paralysis in whooping-cough were described by Barrier in 1842, Rilliet and Barthez in 1844, and Trousseau in 1866.

The nervous complications that may occur in pertussis may be classified clinically as follows:

1. (*a*) Convulsions and coma.
   (*b*) Spasm of the glottis (rare).
2. Paralysis.
   (*a*) Cerebral type: motor: monoplegia, hemiplegia (complete or incomplete), paraplegia. Sensory: aphasia, deafness, blindness.
   (*b*) Spinal type: spastic. Flaccid, with or without sensory and sphincter changes.
3. Meningeal syndrome and meningo-encephalitis.
4. Peripheral neuritis.
5. Mental and other changes: hysteria, hypochondria, melancholia, epilepsy and dementia.

The pathology of these conditions is often obscure but the following pathologic conditions have been described: (1) no gross lesions, (2) diffuse encephalitis, (3)cerebral hemorrhage, (4) cerebral edema, (5) cerebral softening, (6) cerebral sclerosis, (7) meningeal hemorrhage, (8) serous meningitis, (9) thrombosis of the intracranial sinuses.

Among the etiologic factors suggested are:

1. A spasmophilic diathesis and latent tetany.
2. A mechanical factor, namely, an increase in the intravenous pressure during paroxysms of coughing.
3. A toxic cause, namely, endotoxins secreted by the Bordet-Gengou bacillus or some other virus (the view which the author favors).

Convulsions are more frequent in infants, and nervous symptoms in general occur in severe cases.

Paralyses do not usually occur until the disease has been established for some time, in the majority at about the fifth or sixth week. In all cases of pertussis with nervous complications the prognosis should be regarded as grave.

The author cites three cases: one of right-sided hemiplegia of cerebral origin, and the other two showing a meningeal syndrome, probably due to meningo-encephalitis. All three patients apparently recovered completely.

LANGMANN, New York.

HERPES ZOSTER AND VARICELLA. N. GRAY HILL, Brit. J. Child. Dis. **26**:193 (July-Sept.) 1929.

The author refers to the relationship between herpes zoster and varicella which has been known for many years. He throws no new light on the etiology of these diseases, but advises isolating patients with herpes zoster.

LANGMANN, New York.

UNUSUAL PIGMENTATION AFTER VARICELLA. J. D. ROLLESTON, Proc. Roy. Soc. Med. **22**:1359 (Aug.) 1929.

A boy, aged 5 years, contracted chickenpox during convalescence from a mild attack of scarlet fever, as did three other patients in the ward. About the second week of the rash, when the lesions were in the scabby stage, he showed marked pigmentation. The other three patients did not.

WILLIAMSON, New Orleans.

DISCUSSION ON ENCEPHALITIS LETHARGICA. EDWIN BRAMWELL, IVY MACKENZIE and CHARLES M'NEIL, Tr. Med.-Chir. Soc. Edinburgh, p. 51, 1928-1929; Edinburgh M. J., April 1929.

The opening paper is by Prof. Edwin Bramwell, who states that acute encephalitis has not been present in epidemic form during the past four years, but that the chronic cases are found to be more common. Professor Bramwell has personal records of 700 cases. The somnolence in typical cases seen ten years ago is now less often observed; more frequently the patient exhibits restlessness and insomnia, while there are others showing no ocular or facial palsies. The disease changed somewhat in type, with other symptoms which became regarded as characteristic though not always present. Instead of the brain stem and basal ganglions alone being the origin of the nervous symptoms, focal symptoms appeared referable to the cerebral hemispheres, cerebellum, spinal cord and peripheral nerves. Cases that were light enough to be ambulatory might occur with temporary diplopia. The acute encephalitis is protean in symptomatology, so that there may be many types of cases.

Laboratory help in diagnosis has not become any more definite than when the disease first became known; recognition must occur through the mode of onset and its course. Sometimes the clinician can only give a probable diagnosis. Of

all the disorders which come into differential diagnosis, Bramwell refers to only three. Tuberculous meningitis should have a history that is characteristic; although the cells in the spinal fluid may be lymphocytes in both diseases, the presence of tubercule bacilli will make the case clear. Cerebral vascular lesions occur which are hard to differentiate at times, but these are in elderly persons. Tumor of the brain, when accompanied by drowsiness or if situated in the midbrain region, is difficult to exclude. The pathologic anatomy is still principally an infiltration of brain tissue and the perivascular sheaths; small hemorrhages and neuronal degeneration are common.

Bramwell found that there is no risk of transmission by contact from one person to another; that the mortality rate is not so high as early figures placed it. In slight cases the patient may recover entirely, or many months later insidiously develop the parkinsonian symptom complex and numerous residua. Treatment is symptomatic, consisting of the use of scopolamine hydrobromide, stramonium or belladonna, but it is of benefit only for the parkinsonian rigidity.

The second part of the discussion is by Dr. Ivy Mackenzie who states that in Glasgow from 1919 to 1924 the disease was epidemic and the character of the clinical manifestations became milder. In the early part of this period lethargy and coma were characteristic, but later the majority of cases showed delirium, chorea and myoclonus. There were 1000 cases in 1924 in Glasgow; the first symptoms were often mild and not recognizable as belonging to encephalitis, but sequellae enabled one to make the diagnosis. The virulence evidently became attenuated and the epidemicity disappeared. Though, one may be far from a true conception of the pathology of the disease, it is undoubtedly related to disorder of the extrapyramidal system. In the acute case an active virus is responsible for the symptoms; in chronic cases, as for example the cases with the parkinsonian symptom complex, the virus is not active nor is there inflammation, but rather a degeneration following a process that has ceased.

In the next discussion Dr. Charles M'Neil spoke of the incidence in children. He had twenty-two cases in the hospital since the year 1922. All but one developed in the winter months, a marked contrast with the summer incidence of poliomyelitis. M'Neil mentions the confused catalogue of symptoms, but expresses his belief that two cardinal changes stand out as characteristic: a muscle and mental disturbance especially of the emotional type. Both changes may be associated, so that muscular excitement such as chorea or clonus is found with excitement or loss of emotional control.

The disease may be separated into two stages or these may be combined: the first usually develops suddenly, with disturbance of activity of the muscles and mind; the second phase lasts much longer, but may start suddenly. Both stages commonly show some excitement and increased activity, after which depression occurs. M'Neil cites the case of a boy aged about 5 years, who first had shooting pains from the neck down to the tips of the fingers, twitching of arms and legs, and sleeplessness for thirty-six hours, lapsing into lethargy, with diplopia. For months there was only slow improvement, but at the end of the year the boy became irritable and had periods of insomia. His muscles became awkward and stiff, his face masklike, and his mind somewhat acute but timid and irritable.

Children are more prone to have choreiform movements in the first stage; the behavior of the child is characteristically changed in the second stage, though the body activity is retained. The parkinsonian syndrome results not infrequently in childhood; it is similar in appearance to that of adults.

Diagnosis from the following conditions offers most of the difficulties: tuberculous meningitis with coma; polioencephalitis has early symptoms of excitement; rheumatic chorea usually does not affect the sleep, while in encephalitis definite insomnia is present — the child's emotional state is inclined to be one of anger rather than laughter or tears; rheumatic pains with fever resembling rheumatic infection may be present early in encephalitis, but as soon as sleeplessness and twitching appears the differentiation is easier. Late in encephalitis there is little difficulty in diagnosis.

Prognosis for life is reasonably good, but for a sound mind and unimpaired muscular system the outlook is poor. The favorable feature is that in the future there will be only a few sporadic cases and no large epidemics.

NEFF, Kansas City, Mo.

A PROPHYLAXIS FOR SCARLET FEVER BY THE BACTERIOLOGIC CONTROL OF CONVALESCENTS. M. LIÉGEOIS and J. FRICKER, Presse méd. **37**:1200 (Sept. 14) 1929.

The technic consists in obtaining cultures of the throats of convalescents from scarlet fever for hemolytic streptococcus. It was found that discharged convalescents with positive cultures could cause a spread of the infection.

SANFORD, Chicago.

CLINICAL OBSERVATIONS DURING AN ENDEMIC OF ERYTHEMA INFECTIOSUM. A. SIWE, Monatschr. f. Kinderh. **45**:152 (Oct.) 1929.

In an epidemic of twelve cases the writer found the incubation time as high as from seven to twelve days. Prodromes consisted of headache, somnolence and anorexia. The temperature occasionally went higher than 39 C. (102.2 F.). The general condition remained good. The duration was from one-half to seven days. Observations on the blood were not characteristic. There were recurrences in some patients. The degree of contagiousness was considered to be about 30 per cent.

In only two cases did the erythema show the typical gyrate form. In the others it was more like scarlatina or erysipelas. The only complications were extensive edema and sometimes hemorrhages into the skin. Susceptibility to tuberculin seemed increased.

GERSTLEY, Chicago.

SPONTANEOUS RECOVERY IN DIPHTHERIA. FRANZ HAMBURGER and J. SIEGL, München. med. Wchnschr. **76**:1537 (Sept. 13) 1929.

The authors studied twenty patients who recovered from diphtheria without the administration of antitoxin. Eighteen were children and two were adults. One adult continued to give a positive reaction to the Schick test after recovery. Fourteen of the children gave positive reactions to the Schick test shortly after recovery. Ten children were examined from four to twenty-three months after diphtheria, and one child after a period of three years. In this follow-up group, eight had given positive reactions to the Schick test shortly after recovery and six continued to do so. One of the three that had given a negative reaction later gave a positive reaction. From these observations, the authors conclude that in many cases of diphtheria in which spontaneous recovery takes place there is no demonstrable antitoxin in the blood. They feel that there are factors other than antitoxin in the immunity to diphtheria. There are many carriers giving positive reactions to the Schick test who do not develop diphtheria; in addition, persons who have showed a negative reaction have developed diphtheria. Hamburger and Siegl warn against promising too much when a patient is actively immunized. There are no references to results or statistics from this country.

BRAHDY, Mt. Vernon, N. Y.

THE SIGNIFICANCE OF THE NEGATIVE PHASE IN DIPHTHERIA. J. SIEGL, Wien. klin. Wchnschr. **42**:1322 (Oct. 10) 1929.

The author states that he has observed three infants with a negative Schick reaction, whose blood contained no antitoxin; with five times the usual dose of Schick toxin, the reaction became positive in two. In four other cases, the Schick reaction became positive after repetition while the antitoxin in the serum diminished. One such case is particularly noteworthy: On two occasions, the antitoxin titer

of the serum lay between 1.28 and 0.64 units cubic centimeter; the Schick test was then performed, and proved to give a negative reaction; on the second and third day after the test, the antitoxin titer was found to lie between 0.02 and 0.004 units; two days later a skin test with a double quantity of Schick toxin was positive, and the original test area became inflamed. In four tests during the following nine days, the serum showed less than 0.004 units of antitoxin per cubic centimeter. The child contracted mild nasal diphtheria. The author calculated that the quantity of antitoxin which had disappeared from the patient's blood plasma must have amounted to between 3.7 and 7.4 units; whereas the amount neutralizable by the injected Schick toxin was 0.0002 units. No explanation is offered; but the phenonomenon may explain the sudden development of diphtheria in a child who is supposed to be immune.

In several other children the author was unable to demonstrate a fall in the titer of antitoxin in the serum after the Schick test or during active immunization.

The method for determining the antitoxic titer of the serum is not stated.

CLAUSEN, Rochester, N. Y.

THE CAPACITY FOR FILAMENT FORMATION IN THE SPUTUM. II. THE MUCIN CONTENT OF THE SPUTUM OF PERTUSSIS. J. JOCHIMS, Ztschr. f. Kinderh. **47**:269, 1929.

According to a previous communication, the sputum of uncomplicated pertussis in the convulsive stage gave very high values for filament formation, particularly in comparison with the similar sputum of chronic bronchitis. Determinations of the mucin content of the sputum of whooping cough were carried out according to the method given by Wanner. The mucin values of moist sputum lay between 1.0 and 2.4 per cent. For pertussis in the convulsive stage these values agree with the data given by Wanner for the sputum of chronic bronchitis. The explanation of the great filament formation does not depend on the presence of much mucin.

EMERSON, Boston.

PROPHYLAXIS OF MEASLES IN PATIENTS WITH SCARLET FEVER AND DIPHTHERIA. A. LICHTENSTEIN, Acta paediat. **9**:77, 1929.

Pooled serum from patients convalescing from measles, in doses of from 2.5 to 3 cc. given on the fourth or fifth day after exposure, protected healthy children but failed to protect hospital patients suffering from scarlet fever or diphtheria. When the dosage was increased to 7.5 to 15 cc. for patients with diphtheria, and to 15 to 30 cc. for patients with scarlet fever, protection was conferred, with a resulting abortive attack of measles or no attack at all. The same batch of pooled serum was used in all the experiments.

MCINTOSH, Baltimore.

PRESENCE OF IMMUNE BODIES IN THE CANTHARIDIN VESICLE FLUID OF TYPHOID PATIENTS DURING CONVALESCENCE. H. SUGITA, J. Pediat. (Tokyo), Sept. 20, 1929, no. 352, p. 1503.

The author studied the effect of fluid formed in the vesicle produced by an application of cantharidin on the skin of a 9 year old patient with typhoid fever, on the seventeenth day after defervescence when the stool culture became negative for typhoid bacillus. This fluid was injected subcutaneously into the abdominal wall of mice in two repeated doses; this caused a temporary leukocytosis at the end of twenty-four hours but the normal value returned at the end of forty-eight hours. Into these animals, ten times the lethal dose of *Bacillus typhosus* culture was injected, but they all survived. From this simple experiment, the author concludes that there are immune bodies present in the fluid obtained by means of the application of cantharidin in patients with typhoid during convalescence.

KATO, Los Angeles.

Chronic Infections

CONGENITAL SYPHILIS OF THE STOMACH. J. RUSSELL VERBRYCKE, JR., Am. J. Syph. **13**:524 (Oct.) 1929.

A boy, aged 13, had complained of epigastric pain and vomiting, which increased and were later accompanied by an increasing feeling of fulness and discomfort, and at times was described as a "real aching pain." There were also occasional attacks of vomiting shortly after meals, the vomitus containing considerable amounts of gastric contents; these were followed by relief in from ten to fifteen minutes. The physical examination gave negative results, with the following exceptions: The stomach contents gave a reaction for free hydrochloric acid, and there was considerable mucus and some streaking of blood. Under fluoroscopic examination, the "stomach was found to be of a peculiar boot shape, of fair tone, but with slight increase in size of the fundus extending down to nearly the distal third. Here the shadow became very narrow, producing almost an hour-glass picture but with the entire antrum narrow and irregular. It was typically the sort of appearance that one might expect in advanced malignancy. Emptying occurred within six hours." This condition was thought to be due to syphilis. The Wassermann reaction of the blood was reported as strongly positive.

The patient was given intense syphilitic treatment with arsphenamine and iodide. His subjective improvement was pronounced, his gain in weight was rapid, but the roentgen examination did not show as marked change as was anticipated. The Wassermann reaction was not affected.

ROYSTER, University, Va.

CONGENITAL SYPHILIS OF THE PANCREAS. WILLIAM C. MENNINGER, Am. J. Syph. **13**:527 (Oct.) 1929.

Congenital syphilis frequently manifests itself by changes in the pancreas, probably as often as in any other internal organ. The pancreas usually is increased in size and is much more fibrous and firm. Microscopically it presents a picture of excessive perivascular connective tissue proliferation of an interstitial distribution. The islands of Langerhans escape involvement until very late in the process and are then affected only indirectly by the choking connective tissue about them. Gumma formation in the pancreas is exceptional.

Clinically, the cachexia of congenital syphilis has been ascribed to pancreatic involvement as have acetonuria and acidosis. It is probable that certain cases of diabetes mellitus in children result from a congenital syphilitic pancreatitis, but there is insufficient evidence to suggest the frequency of this etiology in infantile diabetes.

AUTHOR'S SUMMARY.

THE KAHN REACTION WITH SPINAL FLUID. R. L. KAHN and ELIZABETH MCDERMOTT, Am. J. Syph. **13**:557 (Oct.) 1929.

1. The regular Kahn test with spinal fluid in which standard antigen is employed gives more sensitive reactions when carried out with the total amount of globulin, obtained by saturation of the fluid to 50 per cent with ammonium sulphate, than with a portion of the globulin obtained by saturation to 40 per cent. The method employing 50 per cent saturation is free from falsely positive reactions but is not free from falsely negative reactions.

2. The presumptive Kahn test with spinal fluid in which sensitized antigen is employed, is considerably more sensitive than the regular test. The presumptive test is especially more sensitive in treated patients with neurosyphilis and appears to be highly sensitive in detecting cases in which no treatment has been given.

AUTHORS' SUMMARY.

EARLY TUBERCULOSIS IN A CHILD: MEDIASTINAL GLANDULAR ENLARGEMENT OF TUBERCULOUS ORIGIN. J. J. GOLDSTEIN, M. J. & Rec. **130**:322 (Sept. 18) 1929.

A child, aged 3½ years, was admitted to the hospital with the diagnosis of lobar pneumonia in the left lower lobe. During the course of her illness, the pulse rate was out of proportion to the temperature; on the day of discharge, the temperature was 98 F. and the pulse rate 120, which was significant of a tuberculous infection. A roentgenogram of the chest on admission, December 7, showed a pneumonic process of the middle and upper half of the left lower lobe. On December 26, a roentgenogram showed pneumonic infiltration in the right parabronchial region and on the left side in the region of the hilum. On April 9, a roentgenogram showed dense pneumonic infiltration extending out from the hilum into the lung fields. Clinically at this time, the child was suffering from pressure symptoms caused by enlarged intrathoracic glands.

WILLIAMSON, New Orleans.

TUBERCULOSIS AND ASTHMA IN CHILDREN: THE INCIDENCE OF POSITIVE TUBERCULIN TESTS IN CHILDREN WITH ASTHMA AND THEIR RELATIONSHIPS. HENRY A. REISMAN and RAOUL L. MASON, New York State J. Med. **29**:919 (Aug. 1) 1929.

Of 158 consecutive cases of asthma admitted to the asthma clinic of the Post Graduate Hospital, 61 (38.6 per cent) showed a positive tuberculin reaction. Studies of children with asthma show that much of this disease is due to tuberculosis, probably through sensitization to tuberculin.

Tuberculin therapy was given to thirty children who were tuberculin-positive and who had resisted all other forms of treatment. The results were excellent. The tuberculin therapy in many cases acted like a specific. In some, relief was obtained after the Mantoux test and before tuberculin therapy was given. Asthma of this type is more likely to be due to sensitization than to obstruction from tracheobronchial glands. The cases with the least amount of disease responded better to treatment.

AIKMAN, Rochester, N. Y.

A CLINICAL STUDY OF CONGENITAL NEUROSYPHILIS. FERGUS R. FERGUSON and MACDONALD CRITCHLEY, Brit. J. Child. Dis. **26**:163 (July-Sept.) 1929.

The authors emphasize the importance of:

1. The routine search in children for stigmas of congenital syphilis. Among the "somatic manifestations" which they found in 80 per cent of their cases, they list the following: Hutchinson's teeth, stunted growth, irregular carious teeth, moon teeth, interstitial keratitis choroidoretinitis, cardiac murmurs, kyphoscoliosis, rhagades, frontal bossing, abnormalities of the hair (coarse, syphilitic wig, baldness), scars on the legs, leukoplakia, perforation of the palate, "saddle-nose," hydrocephalus, enlarged liver, snuffles, tibial nodes, adenitis and deafness.

2. The necessity for careful inquiry into the previous history for evidence of iritis, fits in infancy, backwardness (mental and physical), jaundice, snuffles, rashes, etc.

3. The importance of a complete family history, with especial note on miscarriages, stillbirths, etc.

4. Examination of the blood and cerebrospinal fluid.

Congenital syphilis gives rise to cortical cell atrophy and sclerosis, with resulting mental defect, convulsions and spastic paraplegia, whereas acquired syphilis is characterized by central softening from arterial disease producing hemiplegias and monoplegias. Meningitis, endarteritis and gummas may occur in both types.

In order to make the diagnosis of congenital neurosyphilis one must have neurologic signs or symptoms.

The Wassermann reaction of the blood was positive in 94 per cent of the cases of this series. The authors conclude that a positive reaction is not an absolute necessity for making the diagnosis. They observe that a clinical diagnosis of congenital neurosyphilis may be made under the following conditions: if in addition to signs and symptoms in the nervous system there is (*a*) a positive Wassermann reaction together with either a positive history or stigmas, or (*b*) if the Wassermann reaction is negative (in the blood) and both a positive history and definite stigmas are present.

They group their fifty cases as follows: congenital paresis, sixteen; congenital taboparesis, six; congenital tabes, seven, and heterogeneous forms, thirteen.

Under possible clinical manifestations of congenital neurosyphilis are listed: (1) epileptiform convulsions, (2) mental defect, (3) meningitis, (4) hydrocephalus, (5) cranial nerve palsies, (6) paralysis of the extremities, and (7) "the nervous child." The authors report convulsions in eighteen of their patients.

LANGMANN, New York.

TRACHEOTOMY AND TUBERCULOSIS. J. D. ROLLESTON, Brit. J. Child. Dis. **26**:200 (July-Sept.) 1929.

Landouzy, in 1899, asserted that children who had undergone tracheotomy for laryngeal diphtheria were especially susceptible to tuberculosis and very few reached adult life. Many subsequent writers disagreed with this contention and cited statistics to prove their point. Rolleston is inclined to side with the latter. He cites the case of a mother and child both of whom had severe laryngeal diphtheria which necessitated tracheotomy; also the report of several adults who had undergone tracheotomy in childhood for laryngeal diphtheria, but had not developed signs of pulmonary tuberculosis.

LANGMANN, New York.

A CASE OF GENERALIZED TUBERCULOSIS IN AN INFANT VACCINATED WITH B. C. G. W. RIBEIRO, Arch. de pediat., Rio de Janeiro **2**:416 (Sept.) 1929.

A child, aged 4 months, presented symptoms of tuberculous meningitis and died. Autopsy showed generalized tuberculosis, with caseous adenitis and tuberculous meningitis. The child had been vaccinated with B. C. G. shortly after birth, as a prophylactic measure. There was no particular history of massive exposure, or anything other than the ordinary child might encounter.

SANFORD, Chicago.

CLINICAL PICTURE OF THE SEROUS PLEURITIS OF PARATUBERCULOSIS. H. G. HUBER, Ztschr. f. Kinderh. **47**:169, 1929.

The pleuritides looked on as idiopathic or primary are always secondary and, with few exceptions, secondary to tuberculosis of which they are an early sign. The pleuritis of paratuberculosis is the most frequent of the secondary forms and has an entirely definite course in duration, fever and leukocyte count as well as cytology of the exudate. This characteristic course is looked on as a focal reaction around glands near the pleura or around the focus in the lung, which is the result of specific or nonspecific exogenous and endogenous stimuli. Attention is called to the agreement of the fever curve in paratuberculous effusions of the joint in relation to foci of tuberculous bone with the curve for erythema nodosum in relation to tuberculosis. The course of the fever in such pleuritis of this type is as follows: The fever usually ascends steeply, seldom in a steplike fashion, and in the first five or six days ranges between 39 and 40 C. (102.02 and 104 F.), or many times between 38 and 39.5 C. (100.4 and 103.1 F.). In the second week the temperature usually runs between 38 and 39 C. sometimes between 38.5 (101.3 F.) and 40 C., and at the end of that time, or the beginning of the third week, falls in a steplike way to become completely normal eight days later. The steplike descent is especially characteristic. After cessation of the fever, the temperature continues to be normal. Deviations from this course, such as prodromal fever,

abnormal duration of fever, irregularity of the falling leg of the curve or incomplete fall with continued mild fever, always signify that there is an active tuberculosis elsewhere at the same time. This form of pleuritis is distinguished from the parapneumonic pleuritis by its temperature curve. The white cell count does not go above 12,000 as a rule, which is characteristic, as is the richness of lymphocytes in the fluid. Therapeutic measures during the stage of the fever are of no avail; puncture is indicated only in the stage of increasing exudate when there is much dyspnea and increasing signs of pressure appear. In a child, a hastening of the resorption or of the cure of the disease is not to be expected from operation, which may on the other hand bring about a relapse.

EMERSON, Boston.

OSTEOCHONDRITIS LUETICA IN LATER CHILDHOOD. F. MOSES, Ztschr. f. Kinderh. **47**:242, 1929.

A child who had congenital syphilis, showed, at the time she began to go to school, osteochondritis at all points of ossification of the skeleton. Until her admission to the hospital, the process was fairly well healed with the exception of fresh lesions in some of the hollow bones; the characteristic double lines in the old processes were still visible roentgenologically, as were other signs, such as the excavated areas in the skull and the caries of the lower jaw. The aplastic anemia which the patient developed was looked on as secondary to the skeletal condition, and the secondary infection of the lower jaw led to a general septic infection and death. The occurrence of osteochondritis luetica beginning in infancy has not been previously reported. There were many things in this case which pointed to tuberculosis and a negative family history, and a negative Wassermann reaction pointed away from syphilis, so that the diagnosis was not made until the autopsy was done and the roentgenograms were examined. The characteristic roentgenologic observations of a band about 1 cm. wide going across the bone like a diaphragm, about 2.5 cm. above the normal lower epiphyseal line and the location of fracture lines at the metadiaphysis, and the course of the disease were the deciding factors.

EMERSON, Boston.

THE SIGNIFICANCE OF THE VEGETATIVE NERVOUS SYSTEM FOR THE SYMPTOMATOLOGY AND COURSE OF TUBERCULOSIS IN CHILDHOOD. A. KROVITZKY and D. SCHENKMANN, Ztschr. f. Kinderh. **47**:248, 1929.

The examination of the functional condition of the vegetative nervous system in relation to the symptomatology and course of tuberculosis in childhood, according to the method of Dresel (the injection of from 0.5 to 1 cm. of 1:1,000 solution of epinephrine chloride, subcutaneously, for its effect on the blood pressure and pulse frequency), shows a definite lability of the whole system. Cases with a favorable course, the fibrotic form, one sees principally in vagotonia; cases with an unfavorable course, the exudative form, in sympatheticotonia. Usually the variations in the functional condition of the vegetative nervous system in tuberculosis run parallel to the clinical picture.

EMERSON, Boston.

THE QUESTION OF FOCAL REACTION IN TUBERCULOSIS. H. KOCH, Ztschr. f. Kinderh. **47**:265, 1929.

In erythema nodosum no focal reaction occurs either in the spots themselves or in the faded Pirquet reaction, nor can any reaction be obtained in the faded Pirquet test in the beginning of the primary stage of tuberculosis. The basis for this condition lies in the great sensitiveness of all the tissues to toxin at this time, and the nonappearance of the focal reaction in erythema nodosum is not evidence at all against the tuberculous etiology of this disease.

EMERSON, Boston.

Internal Diseases

ALLERGIC DISEASES IN CHILDHOOD. T. WOOD CLARKE, New York State J. Med. **29**:1126 (Sept. 15) 1929.

Skin tests were made in 134 cases with 300, or 8 per cent, positive reactions. In seventy-seven cases of eczema, 1483 tests were made with 153, or 10 per cent, positive reactions. In forty cases of asthma, 1784 tests gave 97, or 5 per cent, positive reactions. A study of 118 tests in nine cases of hay-fever gave 35 or 29 per cent, positive reactions.

Every case of eczema, urticaria, recurrent bronchitis and allergic shock, should be thoroughly studied by skin tests to determine the allergic origin.

AIKMAN, Rochester, N. Y.

THE TREATMENT OF DIABETIC COMA IN CHILDREN. GLADYS L. BOYD, Canad. M. A. J. **21**:520 (Nov.) 1929.

During the past six and one-half years, fifty-one patients in diabetic coma have been brought to the hospital for sick children at Toronto. Most of these were the result of undiagnosed and untreated diabetes or of neglect.

Early diagnosis and treatment is essential; fifteen patients were treated within twenty-four hours of the onset of coma, with no mortality; ten patients, within twenty-four to forty-eight hours, with 20 per cent mortality; seventeen patients within forty-eight to ninety-six hours, with 41 per cent mortality, and nine patients after five days or longer, with 77 per cent mortality.

In spite of insulin the death rate in diabetes, which reached the lowest point (12 per cent) in 1927, went up to 25 per cent in 1928 and is still higher this year. This is due to careless, overweight diabetic patients and to coincident infection of sufficient severity in itself to cause death.

The author gives in detail the treatment and management of infections in patients with diabetes and with diabetic coma.

MOORE, Omaha.

SOME POINTS IN THE DIAGNOSIS OF CARDIAC LESIONS IN CHILDREN. R. H. SIMPSON and LINDSAY W. BATTEN, Lancet **2**:372 (Aug. 24) 1929.

In young adults, dyspnea on exertion and edema of the feet are relatively early and constant symptoms of myocardial weakness; in children both are uncommon and both, but especially the second, indicate an advanced and serious degree of cardiac insufficiency. The place of dyspnea as an early symptom is, to some extent, taken by listlessness and disinclination for activity, which in a child of previously energetic disposition, are somewhat suggestive of cardiac insufficiency.

The heart is more horizontal and relatively larger in childhood than in adult life. Reduplication or splitting of either sound is common and of little importance.

The so-called third heart sound deserves attention because it is apt to be mistaken for the mid-diastolic murmur of mitral stenosis. It is heard near the apex of the heart in a large proportion of children and consists of a short sound, occurring in diastole rather longer after the first sound than a reduplication. It is said to be due to the sudden tension of the mitral valve in diastole and has no harmful significance.

Three types of murmurs are: (1) transient or accidental murmurs which are of no pathologic significance; (2) temporary or atonic murmurs due to a relaxation of the normal tone of the myocardium; (3) permanent or organic murmurs which may be congenital or acquired.

The authors do not point out clearly the means of distinguishing between the first two types of murmurs.

The classic signs of mitral stenosis — the rough crescendo presystolic bruit with its thrill and slapping first sound — occur only when the lesion is established. In a child the sign of developing stenosis is not a roughening of the first sound but a mid-diastolic murmur, best heard and sometimes only heard after exercise.

In doubtful cases the necessity for reaching a decision in the earliest possible moment should never be forgotten.

Six months of doubt and caution with restrictions of exercise and play in an atmosphere of anxiety are unlikely to stop the progress of an insidious carditis but are well calculated to sow the seeds of a cardiac neurosis, difficult or impossible to eradicate.

Six months of rest in bed to recover from cardiac dilatation may prove to be soundly invested.

LANGMANN, New York.

SUBCUTANEOUS NODULES IN THE SCALP IN FATAL CASES OF GLANDULAR ENLARGEMENT WITH MONONUCLEOSIS. F. JOHN POYNTON and ALAN MONCRIEFF, Lancet **2**:812 (Oct. 19) 1929.

The authors cite the cases of a boy, aged 3 years and 4 months and another aged 2, both of whom showed generalized glandular enlargement, especially of the cervical lymph nodes. The blood counts showed a moderate reduction of red cells and a progressively increasing leukocytosis which, in the first boy, rose to 62,000; the large lymphocytes and mononuclear cells were 83 per cent at the last count.

The first patient was taken home against advice and died; no autopsy was done.

On entry to the hospital, the second patient showed numerous nodules in the scalp, but at postmortem examination no nodules were found; the lymph nodes showed an increase in fibrous tissue, hyperplasia of all the cells and a slight increase in eosinophils, conforming to the "lymphadenoma" type of glandular hyperplasia.

The authors suggest that the reactions of the blood to infections in childhood be studied unhampered by the conception of certain primary diseases of the blood. Many of the unusual blood pictures do not fit into the present pigeon-holes. The illness of the first child was diagnosed leukemia, and that of the second, lymphadenoma.

LANGMANN, New York.

THE SKULL IN OSTEOSCLEROTIC ANEMIA. DAVID M. GREIG, Edinburgh M. J. **36**:470 (Aug.) 1929.

Greig, conservator of the Royal College of Surgeon's Museum, reports in detail the characteristics of the skull in osteosclerotic anemia, a pathologic condition first brought notably to the attention of the profession by Albers-Schönberg, of Hamburg, and since then by several others, among them Cooley, Witwer and Lee in the AMERICAN JOURNAL OF DISEASES OF CHILDREN in 1927. The disease appears in a congenital form, possibly familial, and in some instances comes on late in life.

In true osteosclerotic anemia, even with generalized bone involvement, the first change is in the bones, the anemia being secondary to the sclerosis and to the osseous hypertrophy which obliterates the bone marrow and destroys it as a blood-making organ. This destruction of the bone marrow is compensated by a return of the blood-forming function of the spleen and liver, both of which become enlarged.

Other diseases in which the end-results might seem similar are certain primary diseases of the blood which are accompanied finally by generalized osteosclerosis, but this osseous solidification is a late feature, not early as in the primary hardening of osteosclerotic anemia.

Reticulo-endothelial disease shows hyperemia of the bones, with decalcification, softening and bending; these deformities exclude it from the type under discussion.

The author discusses the cases reported in literature, the diagnosis being made both by roentgenography and by autopsy. His own case is that of a boy, aged 11, who was mentally deficient and who died of intense anemia and progressive general asthenia. Greig gives the features of the solid and compact skull, and describes the appearance and detail of each cranial bone. The cranial capacity is diminished due to premature synostosis; the brain has been compressed, resulting in microcephaly. The idiocy is progressively worse all through life. Osteosclerosis

has increased density of bone. Fractures may or may not occur. Roentgenograms show marble-like shadows, homogeneous in appearance. All the bones developed in membrane are affected. The detailed description of the child's skull makes this contribution of Greig a valuable one.

The cause is not known, but Greig believes it well to report all such cases, learning what the pathologic entity may be, in order that types of diseases with bone changes and blood dyscrasias may be separated from true osteosclerotic anemia.

NEFF, Kansas City, Mo.

ANEMIA IN INFANCY AND MEDICATION WITH IRON. J. COMBY, Progrès méd. **44**:1838 (Oct. 30) 1929.

Two varieties of anemia are frequently found in infancy: that due to dystrophy and that due to a high feeding of milk which is poor in iron. This is seen most often in the second semester of life, and is fairly common. In these cases the blood does not show a great diminution of red cells, but a great diminution of hemoglobin. Iron is specific for this condition. The salt used is protoxalate of iron and the dose is from 5 to 10 cg. per day for 1 year of age, or iron and ammonium citrate in a dosage of from 25 to 50 cg.

SANFORD, Chicago.

THE PATHOLOGY OF PNEUMONIA IN INFANTS. P. HEIM and G. ERÖS, Arch. f. Kinderh. **87**:241 (June) 1929.

The authors present the autopsy observations on twenty-three cases of bronchopneumonia. The etiology was of the grippal type; aspiration pneumonia (septic) following dysentery, pertussis and tuberculous pneumonia. In fifteen cases the process extended from the hilus and infiltrated in and about the bronchi, involving more or less of each lung.

SANFORD, Chicago.

THERAPEUTIC INDICATIONS IN DISEASES OF THE KIDNEYS. K. STOLTE, Arch. f. Kinderh. **87**:259 (June) 1929.

Stolte believes that too much importance is placed on the albumin and the cell in diseases of the kidney, and not enough on the metabolic products which are not excreted. These are after all the products that are injurious to the organism, and their action on the entire organism determines the clinical picture and the prognosis in all cases of nephritis. The recognition of the true condition of the patient necessitates not complicated chemical procedures but a careful clinical analysis.

SANFORD, Chicago.

PATHOLOGY OF NURSLINGS' PNEUMONIA. PAUL HEIM, Monatschr. f. Kinderh. **45**:119 (Oct.) 1929.

In an address before the students at Breslau, Heim divided pneumonia into two groups. In the first is the type unusual to a nursling, lobar pneumonia. In the other group, namely secondary pneumonia, there are six subdivisions: aspiration pneumonia, chiefly of the new-born; pneumonias as a sequence of severe nutritional disturbance, probably depending on circulatory weakness; a type associated with acute infections, such as pertussis or measles; spetic pneumonias leading to abscess and empyema; the usual catarrhal or grippal pneumonia which is commonly designated as bronchopneumonia, and the pneumonias occurring around foci of tuberculosis which are commonly called metatuberculotic pneumonia.

Pneumococcus, and occasionally *Pneumobacillus,* is the accepted cause of lobar pneumonia. In secondary pneumonias one finds streptococci, staphylococci and influenza bacilli, but in the sputum and in fluid from lung puncture there are also pneumococci.

In classifying pneumococci, American authors have found types III and IV most common in normal throats, while in cases of pneumonia, types I and II

predominate. In the pneumonia of nurslings, however, type IV seems to be the most common.

Intracutaneous injection of *Pneumococcus* suspension gave a local reaction in from eighteen to twenty-four hours. During the first six months, 17 per cent of infants reacted; during the second, 56 per cent; during the third, 92 per cent; and during the fourth six months, 90 per cent. Infants suffering from pneumonia did not react.

Heim then describes pathologic studies and serial lung sections in pneumonia and concludes that pneumonia develops by an extension of the infection from the bronchial glands.

GERSTLEY, Chicago.

AN UNUSUAL COMPLICATION OF BRONCHOPNEUMONIA. J. C. SCHIPPERS, Monatschr. f. Kinderh. **45**:130 (Oct.) 1929.

The author reports a case of bronchopneumonia of long duration. At the end of three and one-half months a bilateral periostitis of the metacarpal bones, with painful swelling of the soft parts, developed and persisted until the pneumonia finally cleared up at the end of five months.

The author gives a review of the literature, discusses various theories and is inclined to attribute the symptom to the effect of toxins.

GERSTLEY, Chicago.

BACTERIOLOGY AND SPECIFIC PROPHYLAXIS OF NURSLINGS' PNEUMONIA. R. NEUMANN and H. HAPPE, Monatschr. f. Kinderh. **45**:141 (Oct.) 1929.

Lung punctures revealed causative organisms in twenty-one of forty-six cases, i. e., in 45.6 per cent: pneumococci were found in nine, staphylococci in eight (in two instances these were hemolytic) and streptococci in four (hemolytic in three instances). Of the pneumococci, all belonged to type I.

The authors made up a vaccine consisting of type I pneumococcus isolated from one of their patients. They used this for prophylactic inoculations in doses of from 50 to 100 million organisms. Each dose was repeated three times.

Of 322 nonvaccinated children, 34 (10.5 per cent) developed pneumonia; of 128 vaccinated children, 8 (6.2 per cent) developed pneumonia. The authors express their belief that the vaccine deserves further trial.

GERSTLEY, Chicago.

IRRADIATED ERGOSTEROL IN THE TREATMENT FOR NONSPECIFIC LEUKORRHEA. A. W. BAUER, München. med. Wchnschr. **76**:962 (June 7) 1929.

The author gave ten children with nonspecific leukorrhea 6 mg. of irradiated ergosterol daily for a month. No other therapy was permitted. All objective symptoms disappeared in six cases; in one the condition was greatly improved and in three it was unchanged.

BRAHDY, Mount Vernon, N. Y.

TREATMENT FOR DIABETES INSIPIDUS. HERTMANNI, München. med. Wchnschr. **76**:1377 (Aug. 16) 1929.

Hertmanni found a powdered preparation of hypophysis applied nasally very efficacious in the treatment of a case of diabetes insipidus. Previously the patient had been relieved only by subcutaneous injections of hypophysis. The patient snuffs the new powdered preparation which does not produce any irritation or discomfort. There is no local vasoconstriction, such as occurs after hypodermic injections of hypophysis extracts. The dosage was determined by the patient who snuffed gradually increasing quantities until the amount which gave the desired result was reached.

BRAHDY, Mount Vernon, N. Y.

ORAL ADMINISTRATION OF INSULIN. M. OTTOW, München. med. Wchnschr. **76**:1584 (Sept. 20) 1929.

Ottow tried an insulin preparation recently prepared by Stephan for oral administration. She reports two cases of juvenile diabetes in which the blood sugar was reduced and the urine kept sugar-free by the oral administration of insulin. The effect is not as rapid as that following subcutaneous injection. One child had a fasting blood sugar of 178 mg. per hundred cubic centimeters, and a daily urinary excretion of 18 Gm. of sugar. The urine became sugar-free after dietary regulation, but the blood sugar remained high. Insulin was given by mouth two hours before breakfast when the blood sugar was 178 mg. Two hours later it dropped to 142 mg., and then breakfast was eaten. Two hours after breakfast the blood sugar was 147 mg., and in three hours it was 100 mg. The effect was constant and was properly controlled. The preparation was well tolerated and the author thinks it will be helpful in the treatment in ambulatory cases of diabetes.

BRAHDY, Mount Vernon, N. Y.

RELATIONSHIPS BETWEEN ACUTE APLASTIC ANEMIA, ACUTE ALEUKEMIC LEUKEMIA AND AGRANULOCYTOSIS. L. BICKEL, Wien. klin. Wchnschr. **42**:1186 (Sept. 12) 1929.

The author describes a case of severe dyscrasia of the blood which began with the picture of aplastic anemia, but in which the autopsy revealed typical lymphoid infiltrations in all organs. The literature of similar cases is discussed. In the present instance, it was found that all of the six living members of the patient's family, although they had no symptoms, had various definite anomalies of the circulating blood.

CLAUSEN, Rochester, N. Y.

PLAUT-VINCENT'S ANGINA. J. ZIKOWSKY, Wien. klin. Wchnschr. **42**:1344 (Oct. 17) 1929.

Two forms of Vincent's angina exist: (1) ulcerative: involving one tonsil, with little fever or complaint; and (2) pseudomembranous: involving both tonsils, with severe general malaise, high fever and marked absolute and relative lymphocytosis. The latter is a fairly frequent form (thirteen of fifty-three cases of Vincent's angina), affecting older children and young adults. It lasts from six to fourteen days, with a long ensuing period of weakness, accompanied by moderate anemia and enlargement of all the lymph nodes and of the spleen, with an invariably favorable outcome. The author did not observe a cross-infection. Small doses of neoarsphenamine were used.

CLAUSEN, Rochester, N. Y.

THE CLINICAL PICTURE OF ENDOCARDITIS LENTA IN CHILDHOOD. NEDELMANN, Ztschr. f. Kinderh. **47**:273, 1929.

A girl, aged 10½ years, referred to the hospital with a diagnosis of active tuberculosis, proved to have mitral regurgitation and dilatation of the heart to the left, club fingers, a palpable spleen and a liver 2 fingerbreadths below the costal margin, dulness at the base of the right lung and râles at both bases, marked anemia and a trace of albumin in the urine. Six days later a blood culture positive for *Streptococcus viridans* was obtained. The course in the hospital for the next two and one-half months was typical and the patient died at home two months after discharge. No autopsy was performed.

EMERSON, Boston.

BLOOD SUGAR IN INTESTINAL INFANTILISM. ELISABETH SVENSGAARD, Acta paediat. **9**:22, 1929.

In two patients with celiac disease, one a girl aged 11 years and the other a boy aged 4, the blood sugar level was closely observed after the administration of dextrose by mouth. Determinations were made with the Hagedorn-Jensen

method, at intervals of ten or fifteen minutes, sometimes oftener. In the older patient the blood sugar did not rise above 110 mg. per hundred cubic centimeters after the administration of 1 Gm. of dextrose per kilogram; after 2 Gm. of dextrose per kilogram it rose only to 90 mg. at the end of two and a half hours. Observations on the second patient confirmed this tendency to a flattening of the curve following the oral ingestion of 1.5 Gm. of dextrose per kilogram. Much the same result followed a meal of bread and milk. It was possible in the second patient, by raising the dosage of dextrose to 2 Gm. per kilogram, to obtain an appreciable hump in the curve; and the response to 4 Gm. per kilogram was practically the same as a normal patient would show after the administration of 1.75 Gm. per kilogram. When the ingestion of 1.5 Gm. of dextrose per kilogram was accompanied by a subcutaneous injection of 0.4 cc. of a 1:1,000 solution of epinephrine, the blood sugar took an enormous leap, reaching a peak of about 220 mg. per hundred cubic centimeters in ninety minutes and returning to the fasting level only after three and one-half hours. A week later, an injection of epinephrine alone effected merely a normal glycemic response.

The author was apparently unaware of similar studies by McLean and Sullivan in this country.

McIntosh, Baltimore.

True Nephrosis in Childhood. Cornelia De Lange, Acta paediat. **9**:30, 1929.

The author takes exception to a statement made by Czerny to the effect that the large white kidney is found in young patients only in lymphatic leukemia. She presents case reports of two patients who died after a clinical course that was typical of nephrosis, with autopsy protocols showing deposits of fat in the kidneys in both instances and large white kidneys in at least one of the cases. The literature is partly reviewed and various theories of pathogenesis are discussed. She favors the view that the condition is due primarily to a nephropathy, not to a general disturbance of water, salt, fat or protein metabolism. Published reports of true nephrosis verified by autopsy are strikingly rare, most of the recorded cases showing some degree of glomerular damage.

McIntosh, Baltimore.

Chronic Aleukemic Myeloid Leukemia in a Boy Aged Eight Years. E. Esp, Acta paediat. **9**:89, 1929.

Only a few cases of chronic aleukemic myeloid leukemia have been described in adults, and none have hitherto been reported in children.

A boy who had had whooping cough at 7 years of age, followed by pneumonia and later by chickenpox, began at 7½ years of age to show fatigue, pallor, palpitation, and at times spontaneous hemorrhages into the skin, particularly of the arms and legs. He was not confined to bed, but was treated for two months with iron and arsenic. At 8 years, on admission to the hospital, he showed a few purpuric spots the size of hemp seeds, a systolic murmur, enlargement of the liver, and a blood picture of 19 per cent hemoglobin (Sahli); red blood cells numbered 900,000; white blood cells, 3,940; myeloblasts, 7 per cent; premyelocytes, 14 per cent; basophilic myelocytes, 2.5 per cent; neutrophilic myelocytes, 3.5 per cent; polymorphonuclears, 10.5 per cent; lymphocytes, 57.5 per cent; platelets, 196,300, and reticulocytes, 5 per cent.

Various therapeutic measures were attempted, particularly the administration of iron and arsenic by mouth, ultraviolet light, transfusion, intramuscular injections of milk and liver diet. None of these had any lasting beneficial effect; some of them, especially the ultraviolet therapy, seemed to do harm. During the entire course, there was no appreciable improvement. The blood picture was carefully followed throughout and early myeloid forms were constantly present in considerable numbers. At times the white count rose, though never to more than 26,340; at such times there was an increase in the size of the liver and spleen, with depression of the red cell count and the hemoglobin. At other periods

severe leukopenia was observed, particularly after the transfusions and after injections of milk. The latter caused a reduction in myelogenous elements without influencing the lymphocyte count. Hemorrhages appeared in the retinae from time to time. There was no fever, except for short periods during which the temperature ranged between 37.5 and 38 C. (99.5 and 100.4 F.). Achlorhydria was demonstrated. The patient was taken home after eight months in the hospital. At that time he was weak and pale, the liver edge was half way between the umbilicus and the costal margin, the spleen extended to 3 fingerbreadths above the level of the umbilicus, the blood showed a hemoglobin content of less than 10 per cent (Sahli); the red cells numbered 635,000, and the white cells, 2,820. He died at home six days later. Autopsy was not performed.

McINTOSH, Baltimore.

CASE OF HYPERNEPHROMA MALIGNUM WITH VIRILISM IN A GIRL AGED THREE AND ONE-HALF YEARS. G. LUNDH, Acta paediat. **9**:118, 1929.

The patient first complained of fatigability. On examination she showed considerable enlargement of the abdomen, with a tumor the size of a man's head occupying the upper left part of the posterior abdominal wall. There was a markedly precocious heterosexual development of the external genitalia, and deepening of the voice. Operation was not performed. The characteristics of the tumor as found post mortem are described. The author leans toward the view that such neoplasms originate in aberrant testicular interstitial cells located in the suprarenal gland.

McINTOSH, Baltimore.

HEMORRHAGE INTO THE PARATHYROID GLAND IN AN INFANT AGED THREE MONTHS. A. FRIEDLAENDER, Acta paediat. **9**:129, 1929.

A premature infant, weighing 1,500 Gm. at birth, began at the age of 2 months to have generalized convulsions which were somewhat more marked on the left side. The Chvostek, Trousseau, femoral and peroneal signs were positive. The temperature was at first subnormal, but a catheterized specimen of urine showed pus cells and bacilli. Convulsive manifestations were diminished but not entirely abolished by barbital therapy. About one month after admission, the patient was found dead in bed.

Autopsy showed pigmentation beneath a small area of the dura in the posterior cranial fossa, hemorrhages into three of the four parathyroid glands, and pyelitis. Both the convulsions and the sudden death are attributed to parathyroid hemorrhage. The author pleads for its consideration in differential diagnosis of convulsions in young infants and particularly when death occurs suddenly.

McINTOSH, Baltimore.

STAPHYLOCOCCUS SEPTICEMIA DEVELOPING INTO LYMPHATIC LEUKEMIA. I. LUNDHOLM, Acta paediat. **9**:137, 1929.

A girl, aged 3½ years, previously well, developed a migratory involvement of several joints with swelling, redness and tenderness, associated with fever, sweating, anorexia and loss of weight. After being at home for six weeks with these symptoms, she was admitted to the hospital. The clinical picture continued practically unchanged for a month: In various parts of the body the joints, or more accurately the epiphyseal regions of the long bones, would become painful and would sometimes swell for a few days; then the condition would subside. The leukocyte count was 16,600, with 24 per cent polymorphonuclears.

A spontaneous fracture of the lower end of the right radius and ulna was discovered at roentgen examination. Further study showed that there was decalcification in other parts of the skeleton as well. The appearance suggested chronic septic osteomyelitis. The bones were realined and the condition healed without going on to suppuration.

Blood culture showed *Staphylococcus pyogenes-albus* on three occasions; since some of the colonies grew in the depth of the plates, and transplants showed positive tests for virulence, there was little doubt that this was the pathogenic organism.

After the patient had been three and one-half months in the hospital, generalized enlargement of the lymph nodes developed with enlargement of the spleen and a marked leukocytosis. At the last blood examination, the white count was 138,600, with 3.5 per cent polymorphonuclears and 94 per cent lymphocytes. The patient was taken home and died a month later with marked enlargement of the cervical lymph nodes.

Histologically there was lymphocytic infiltration of the liver, lymph nodes, bone-marrow, kidney and spleen. Aside from parenchymatous degeneration of the liver, none of these organs showed manifestations of a septic process.

The diagnosis of staphylococcus septicemia seems to be grounded on firm evidence. The author finds little reason to doubt that the final picture was that of a true chronic lymphatic leukemia. The literature relating to the concurrence of the two conditions is reviewed. Their relationship appears to be etiologic, rather than coincidental. A theory of bone-marrow infection and exhaustion with compensatory lymphocytosis is proposed.

McINTOSH, Baltimore.

Nervous Diseases

EPILEPSY AND THE CONVULSIVE STATE: A CRITICAL RÉSUMÉ WITH COMMENTS ON THERAPY. SAMUEL BROCK, New York State J. Med. **29**:875 (July 15) 1929.

A general review of epilepsy. While numerous references are made to recent studies, no mention is made of the effect of water restriction.

AIKMAN, Rochester, N. Y.

FURTHER OBSERVATIONS ON CISTERNAL (SUB-OCCIPITAL) PUNCTURE. LEO SPIEGEL, New York State J. Med. **29**:945 (Aug. 1) 1929.

The author has discarded spinal puncture for cisternal puncture because of the distinct advantages of the latter method. He reports 350 punctures. Failure to obtain fluid is nearly always due to having the patient in a faulty position, with the parts not in alinement. Bony deformities and scars may cause difficulty. If the needles are each time sharpened to a conical point like that of a cambric needle, better results are obtained and less headache and stiffness of the neck are noted by the patient.

AIKMAN, Rochester, N. Y.

POLIOMYELITIS IN MANITOBA IN 1928. O. J. DAY, Canad. M. A. J. **21**:554 (Nov.) 1929.

There were 435 cases of poliomyelitis in the Province of Manitoba in 1928, representing an incidence of about 1 in 1,000 of the population. Of these, 237 were in the city, 67 in the suburbs and 133 in the rest of the province. There were 37 deaths, a mortality of 8.7 per cent.

One case occurred in June, 21 cases in July, 143 in August, 231 in September, 35 in October and 5 in November. Of the deaths, 2 occurred in July, 17 in August, 15 in September and 2 in October.

Thirty per cent of the patients were less than 5 years of age; 35 per cent were between 5 and 10 years; 18 per cent were between 10 and 15 years; 10 per cent were between 15 and 20 years; 3 per cent were between 20 and 25 years, and 5 per cent were over age; 56 per cent were in males and 44 per cent in females.

The occurrence of multiple cases in one family was greater in this epidemic than has usually been the case.

The author gives the clinical signs in detail. The commoner physical signs were found to occur in the following percentages: the spine sign, 70 per cent;

rigid neck, 52 per cent; Kernig's sign, 36 per cent, and paresis or paralysis, 49 per cent.

The serum from convalescent patients seems the most logical form of treatment to use.

For the report on results of treatment, 161 cases were selected; 74 of the patients received early treatment; 93 per cent of these showed complete recovery, and 4 per cent residual paralysis; there were no deaths.

Thirty-three patients were given serum after the advent of paralysis: 22 per cent completely recovered, 45 per cent showed residual paralysis and 33 per cent died.

Fifty-four patients received serum: 53 per cent showed residual paralysis and 11 per cent died.

MOORE, Omaha.

SUCCESSFUL CLOSURE OF SPINAL MENINGOCELE, FOLLOWED BY SEVERE REACTION. S. A. WALLACE, Canad. M. A. J. **21**:575 (Nov.) 1929.

The meningocele was closed when the child was 8 months of age. At the time that the meningeal sac was opened there was considerable shock; respirations practically stopped for a few moments. On the following morning the breathing was rapid and shallow; the pulse rate, 160; the temperature, 105.8 F. The anterior fontanel was bulging and tense. A spinal puncture was performed, and a pressure of 22 mg. was found. The cell count was 5,440 per cubic millimeter, with polymorphonuclear cells predominating. Cultures of fluid were sterile.

Following the spinal puncture with relief of drainage and transfusion of blood, the child made a complete recovery.

MOORE, Omaha.

A CASE OF SCHILDER'S DISEASE (ENCEPHALITITIS PERIAXIALIS DIFFUSA). C. T. CHAMPION DE CRESPIGNY and H. H. WOLLARD, Lancet **2**:864 (Oct. 26) 1929.

A previously healthy boy, aged 8 years, developed a progressive illness lasting between five and six months. Failure of hearing and spastic paraplegia were the first symptoms; then a rapidly increasing speech defect leading to dumbness. Sight was gradually lost, and there was spastic paralysis increasing in the lower limbs and extending to the upper. Finally death occurred rather suddenly a few hours after the onset of acute symptoms of the cerebral inflammatory type.

Postmortem examination showed no abnormality except in the brain. It showed no external evidence of disease. On section, an alteration of the white matter of both hemispheres, including the posterior part of the corpus callosum, was found, giving it a "fused gelatinous appearance." The white matter involved was that of the occipital and temporal regions. The microscopic changes were typical.

Demyelinization, which is the characteristic feature of the disease, is not truly periaxial but spreads beyond the medullary sheath and affects the axis cylinders, which ultimately disappear. Perivascular infiltration extends beyond the sharply limited area of demyelinization.

LANGMANN, New York.

ENCEPHALITIS PERIAXIALIS DIFFUSA (SCHILDER). E. D. MACNAMARA, Proc. Roy. Soc. Med. **22**:1359 (Aug.) 1929.

The patient, a girl aged 4 years, had three sisters and a brother. The eldest sister died at the age of 5½ years from Schilder's disease.

WILLIAMSON, New Orleans.

UNCONTROLLABLE CONVULSIONS IN WHICH GROSS CEREBRAL MALFORMATIONS WERE FOUND AT AUTOPSY. RONALD CARTER and T. S. KEITH, Proc. Roy. Soc. Med. **22**:1360 (Aug.) 1929.

The patient, a girl, aged 3 months, was admitted to the hospital on December 31, suffering from fits which came on at 5 weeks of age. At first the fits were momen-

tary and infrequent, but they grew more frequent, the infant having about ten fits a day on admission. The child took nourishment well between the attacks. The cerebrospinal fluid was normal. On January 7, signs of bronchitis were elicited; the child became drowsy and had difficulty in swallowing. She died on January 9. Details of observations on the brain at autopsy are given in the discussion.

WILLIAMSON, New Orleans.

PUNCTURE OF THE CISTERNA MAGNA. DONALD STEWART, Tr. Med.-Chir. Soc., Edinburgh, p. 77, 1928-1929; in Edinburgh M. J. May, 1929.

A previous article in the *Edinburgh Medical Journal* by Stewart was reviewed in the AMERICAN JOURNAL OF DISEASES OF CHILDREN, for 1927; in this article a detailed description was given of the anatomy of the involved structures. Again Stewart wrote on cisternal puncture, dealing chiefly with the method of demonstrating tubercle bacilli (*Edinburgh M. J.* **35**:141, 1928.)

Now Stewart gives a table of measurements of the depth encountered in the puncture of children from 7 days to 12 years of age. One of the interesting facts is the observation in a number of sections that the width of the cisterna magna varies normally from 1 to 2.5 cm. in children, so that a careful operator will not damage the medulla or the fourth ventricle. The sense of resistance met when the needle reaches the occipito-atlantoid membrane is an indication for removing the stillet before advancing 1 or 2 cm. farther, after which fluid should appear.

In eighty of the 250 punctures the object was to ascertain the type of meningitis and to give treatment for it. In four instances the patient was treated for cerebrospinal syphilis, and in 166 nonmeningitis cases the fluid for examination was obtained by cisternal puncture.

In sturdy children who resisted, Stewart used a general anesthesia with ethyl chloride and ether; as a rule, in children more than 5 or 6 years of age, local anesthesia with 2 per cent procaine hydrochloride was used.

Discussing the question of safety of cisternal puncture, Stewart feels, as others do, that it is potentially dangerous in inexperienced hands. There followed in some cases slight pain in the neck and face; transient dizziness occurred in one child. Headache was present less often than after lumbar puncture.

Stewart believes that when fluid can be obtained by lumbar puncture enough information can usually be obtained for diagnostic purposes, but in early tuberculous meningitis the bacilli are not apt to be found as commonly as by the cisternal puncture (93 per cent). Alternating cisternal and lumbar puncture is of value in preventing spinal block, also in cases of compression of the spinal cord. The author feels that cisternal puncture should be alternated with lumbar puncture for tapping and serum introduction in meningococcus meningitis. Irrigation of the subarachnoid space has not been of value in his experience with forms of acute meningitis.

Contraindications to puncture are few; they consist of instances when the cistern is occluded or obliterated by tumor, or when there is cerebral edema or advanced meningitis with the possibility of causing hernia through a foramen.

NEFF, Kansas City, Mo.

Diseases of the Eye

CONGENITAL GLAUCOMA. M. A. DOLLFUS, Nourrisson **17**:287 (Sept.) 1929.

Two cases of buphthalmus occurring in infants aged 3 and 4 months are reported. Developmental errors at the iris angle are held responsible for these early cases: either an absent or poorly developed canal of Schlemm, adhesions between the iris and cornea or obliteration of the spaces of Fontana. The inflammatory reactions which supervene are believed to be secondary. Emphasis is laid on the importance of early diagnosis in order that appropriate treatment may be begun before irreparable damage has been done to the cornea and optic nerve. Congenital syphilis must be considered as a possible cause of adhesions when

present, and antisyphilitic therapy should be given to those with clinical or serologic evidence of the disease. Local treatment consists in the instillation of pilocarpine or physostigmine. The surgical treatment recommended is the sclero-iridectomy of Lagrange rather than a simple iridectomy.

McCLELLAND, Cleveland.

PUPILLARY REFLEX IN NORMAL INFANTS. M. TANAKA, J. Pediat. (Tokyo), July 20, 1929, no. 350, p. 1193.

The author made a careful test on 291 healthy infants as to the first appearance of pupillary reflex and found that it is normally well developed toward the end of the second month, but may be delayed until the age of 6 or 7 months. The reflex seems to be a kind of protective movement of the eyes and is a good index of mental development and power of vision.

Diseases of the Ear, Nose and Throat

PATHOLOGIC CHANGES IN THE TONSILS: A STUDY OF TEN THOUSAND PAIRS OF TONSILS, WITH SPECIAL REFERENCE TO THE PRESENCE OF CARTILAGE, BONE, TUBERCULOSIS AND BODIES SUGGESTIVE OF ACTINOMYCOSIS. H. FIELDING WILKINSON, Arch. Otolaryng. **10**:127 (Aug.) 1929.

Ten thousand tonsils, all that were removed at the Mayo Clinic within a certain period of time, were sectioned and studied microscopically for pathologic changes. The sections were taken across the tonsil about half way between the two poles.

The author states that if the presence of leukocytes in the crypts and ulceration of the epithelium indicate infection, all tonsils are infected; that 14.27 per cent of the tonsils studied showed bizarre pathologic changes of which 11.21 per cent were due to the presence of cartilage and bone in various grades and proportions in the tonsil, the cartilage being found in relatively larger amounts; that fibrosis is relatively increased in cases of cartilage and bone and increases in direct relationship to age; that chronic infection definitely influences the production of fibrosis; that next to bone and cartilage, bodies resembling actinomycosis occur most frequently; and that tuberculosis of a diffuse type, cholesterol, foreign body giant cells associated with cholesterol, and trichinae were observed in a small percentage of the tonsils.

BARNETT, Chicago.

THE RELATIONSHIP OF SINUSITIS AND BRONCHIECTASIS. LESTER H. QUINN and OVID O. MEYER, Arch. Otolaryng. **10**:152 (Aug.) 1929.

In the series of patients with bronchiectasis studied, 57.9 per cent were found to have coexisting sinusitis. This group was considerably younger than the group without the sinusitis, and although the sinuses were diseased few of the patients showed symptoms of such disease. It was further found that the degree of sinusitis was no index to the degree of the bronchiectasis. Experiments were conducted in which iodized oil was allowed to flow through a nasal catheter while the patient was asleep. It was found that large quantities of the oil reached the lungs in this way, due presumably to the inhibition of the throat and respiratory reflexes during sleep. It was considered reasonable to assume that during sleep, pus and infective material may drain from the sinuses through the back of the throat into the lungs in a similar way, causing chronic bronchitis and bronchiectasis.

BARNETT, Chicago.

OBSERVATIONS ON THE OCCURRENCE OF LUNG ABSCESS FOLLOWING OPERATIONS ON THE TONSILS: REPORT OF TWO CASES. MARGARET NOYES KLEINERT, Arch. Otolaryng. **10**:423 (Oct.) 1929.

It has been definitely established that abscess of the lung may result from tonsillectomy under either local or general anesthesia, as any anesthesia that abolishes

the reflexes of the throat will permit aspiration of infective material into the lungs.

Two cases are reported of lung abscess in each of which the tonsillectomy had been done two weeks previously.

BARNETT, Chicago.

Diseases of the Skin

REPORT OF A CASE OF NON-OPAQUE FOREIGN BODY IN THE BRONCHUS. C. A. HEATLY and C. H. JEWETT, Clifton M. Bull. **15**:198 (Oct.) 1929.

A child, aged 2, had sudden severe dyspnea, with rapid labored respiration. Examination showed almost complete suppression of breathy sounds in the right side of the chest. Roentgenograms showed an increase of density in the right lung; the right diaphragm was slightly raised, and the heart and mediastinum displaced to the right. On the basis of these observations the condition was diagnosed as a nonopaque body. Bronchoscopy disclosed a cherry pit.

SANFORD, Chicago.

REPORT OF A CASE OF ACRODYNIA WITH COMPLETE RECOVERY: ARGUMENT IN FAVOR OF THE AVITAMINOSIS. H. HARRIS PERLMAN, M. J. & Rec. **130**: 370 (Oct. 2) 1929.

A case of acrodynia was reported in a girl, aged 2 years. An argument is advanced in favor of alimentary error rather than infection as the etiologic factor. This contention is offered on the grounds that the patient did not receive the benefit of such vitamins as are contained in green fruit and green vegetables. The patient suffered from an infection of the upper respiratory tract which followed the classic symptoms and signs of acrodynia. The disorder was believed to depend largely on a lack of vitamin B in the diet. The view held by some investigators that despite the use of fresh fruit and vegetable juices infants develop acrodynia is counterbalanced by the suggestion that the occurrence of the disease is due to a quantitative rather than a qualitative difference of the fruit juices administered.

The patient rapidly improved after an abundant supply of orange and tomato juice was added to the diet. Complete recovery took place in about six months.

WILLIAMSON, New Orleans.

THE TREATMENT OF ACUTE FACIAL ECZEMA. A. BRANDWEINER, Wien. klin. Wchnschr. **42**:1297, (Oct. 3) 1929.

For the dry type of eczema, 0.5 per cent alcoholic salicylic acid is applied; the area is dried and powdered with talcum. This procedure is repeated six or eight times a day.

When the eczema is of the weeping type, compresses of aluminum acetate or Burow solution, each diluted ten times, are applied frequently. The formation of epithelium is assisted by the application of compresses of 1 or 2 per cent aqueous resorcin; these are not to be used longer than twelve hours.

To remove crusts, hydrous wool fat or ointment of lead oleate is applied for twelve hours. This often cures.

Shaving cream was found to be cooling and healing in many cases of acute eczema. The manufactures furnished the following formula, without coloring matter or scent:

	Gm. or Cc.
Stearic acid	15
Sodium borate, U. S. P.	4
Ammonia (0.92)	6
Water	76

In this formula, stearic acid is present in excess.

For persistent inflammation patients are treated with zinc oxide ointment or Lasser's paste. Since facial eczema is not usually seborrheic but is often accompanied by too little fat in the skin, the author suggests that the vehicle of these

ointments be Unguentum simplex or Axungia porci. These ointments are applied over the former applications; and are removed completely with benzine every three or four days.

CLAUSEN, Rochester, N. Y.

ON THE RELATIONSHIP BETWEEN TUBERCULOSIS AND ERYTHEMA NODOSUM. N. RINGERTZ, Acta paediat. **9**:54, 1929.

To fortify the modern conception that erythema nodosum represents a stage in the progress of tuberculosis in the individual when, shortly after the development of cellular sensitization, there occurs a sudden increase in the amount of circulating allergen, the author presents case reports with autopsy in two patients (aged 19 and 18 years, respectively) who died of active tuberculosis eight and eighteen weeks after the outbreak of the eruption. The time relationships and the degree of development of the tuberculous lesions found at autopsy suggest that the attack of erythema nodosum marked the period when the infection commenced to gain the upper hand.

McINTOSH, Baltimore.

A CASE OF PRIMARY TUBERCULOUS INFECTION OF THE SKIN FOLLOWING TRAUMA. F. WAHLGREN, Acta paediat. **9**:68, 1929.

A boy, aged 7½ years, cut his left foot on a piece of glass. At first the wound appeared to heal normally, but about two or three weeks after the injury cyanosis appeared in the surrounding tissues and the nodes in the left groin commenced to swell. He was admitted to the hospital and an abscess in the groin was drained. Both wounds now became sluggish. The one in the foot was debrided and the gland in the groin excised; biopsy showed tuberculous tissue. A Pirquet test done two and a half weeks after admission gave a faintly positive reaction. Healing was slow, a matter of eight or nine months, and was favored by radiations from a carbon arc lamp.

The argument that this was the primary infection is based on the following evidence: The early apparent healing of the primary wound, followed by an extension of local tuberculous infiltration and development of a tuberculous abscess in the regional lymph node, is typical of other known instances of primary wound tuberculosis; the first tuberculin reaction was weakly positive, and it later became strongly positive; in the histologic pictures of tissue taken from the foot, the amount of necrosis, with little tendency to the formation of typical tubercles favors the theory of a primary lesion.

McINTOSH, Baltimore.

Surgery and Orthopedics

A STUDY OF THE POSTOPERATIVE SYNDROME OF PALLOR AND HYPERTHERMIA. P. INGELRANS and J. MINNIE, Presse méd. **37**:1184 (Sept. 11) 1929.

The authors present several cases in which an operation was performed for various reasons and in which the postoperative course was fatally terminated by extreme pyrexia. Before this termination the patient was very pale. Their theory is that the pyrexia is due to a bulbar irritation that comes by way of the sympathetics. The pallor is due to vasoconstriction of the peripheral vessels for this same reason. A prophylaxis against this termination may be found in a combination anesthesia; that is, using a general anesthetic and blocking off the main nerve trunks with a local anesthetic. They report one case in which this method was used and was successful. Several cases are given in which this syndrome was observed.

SANFORD, Chicago.

SUPPURATIVE ARTHRITIS OF THE COXO-FEMORAL JOINT IN AN INFANT. M. DA ROCHA, JR., Arch. d. pediat., Rio de Janero **2**:401 (Sept.) 1929.

An infant, aged 1 month, presented pain, swelling and redness of the coxo-femoral joint, with a temperature of 38 C. (100.4 F.). A roentgenogram showed a

shadow at the joint which was interpreted as a malignant growth; roentgen therapy was advised. An operation later disclosed a suppurative condition involving the joint and part of the femur. The author presents this case to illustrate the danger of relying on roentgenograms without taking into consideration the clinical picture. Here the classic signs of pain, redness, swelling and temperature should have led at once to the diagnosis of suppuration.

SANFORD, Chicago.

THE EARLY DIAGNOSIS OF APPENDICITIS IN CHILDREN. EMIL FLUSSER, München. med. Wchnschr. **76**:1542 (Sept. 13) 1929.

Flusser describes the difficulties in the early diagnosis of appendicitis in children. He has found that in many children operated on for acute appendicitis there are in addition to the acute inflammatory changes evidences of chronic inflammation. The previous attacks of appendicitis were probably not recognized, because children do not manifest the cardinal signs and symptoms which are present in adults. On the other hand, a child may have one or two symptoms which if remembered as possibly due to appendicitis will greatly aid in the proper diagnosis. Anorexia, tenesmus, limping with the right leg in the absence of disease of bone or joint and urinary disturbances, such as urgency, frequency or suppression, are all important symptoms. The physical examination may be misleading because children do not localize pain exactly, or they may cry and obscure rigidity of the abdominal wall. A helpful sign appearing later in the disease is absence of the right lower abdominal reflex, as described by Leiner. The author thinks that appendicitis is frequently overlooked during the acute infections, especially those of the influenza type.

BRAHDY, Mt. Vernon, N. Y.

CONDITIONS SIMULATING ACUTE APPENDICITIS IN CHILDREN. P. EICHENWALD, Wien. klin. Wchnschr. **42**:1234 (Sept. 19) 1929.

Clairmont's statistics show that in 20 per cent of the children admitted to the hospital with the diagnosis of acute appendicitis, and in 6 per cent of those operated on in the hospital, other conditions really existed. The author lists and gives a differential diagnosis of the conditions which simulate appendicitis as follows:

The conditions outside of the abdomen are: Pneumonia with basal pleurisy, grip, angina, the onset of measles, of scarlet fever and of poliomyelitis, the neuralgia of herpes zoster, trauma of muscles, spondylitis, acute coxitis and osteomyelitis of the pelvic bones.

The conditions in the retroperitoneal region are: urinary stone, phlegmonous pericystitis, pyelocystitis, perinephric abscess, torsion of the testicle, phlegmons and metastatic suppuration of retroperitoneal glands and pain from vas deferens.

Abdominal conditions not requiring operation are: enteritis, typhoid, paratyphoid dysentery, ascariasis, umbilical colic, cyclic vomiting, menstrual and premenstrual disorders, tuberculosis of the glands and pneumococcus peritonitis.

Abdominal conditions requiring operation are: peritonitis, volvulus, mesenteric cysts, inflammation of Meckel's diverticulum, strangulated hernia and intussusception.

No adequate mention is made of the abdominal pain associated with infections of the throat.

In case of doubt, operation may prove a lesser risk than delay.

CLAUSEN, Rochester, N. Y.

ADHESIONS OF THE LABIAE MINORES IN INFANTS AND YOUNG GIRLS. R. LEDERER, Wien. klin. Wchnschr. **42**:1362 (Oct. 17) 1929.

This very common condition, scarcely mentioned in most textbooks of pediatrics but well described by Ochsenius (*Deutsche med. Wchnschr.* **20**:838, 1927) is more completely discussed by the author. In the less severe form, only the posterior

portions of the labiae are adherent; in the most severe form, a membranous closure of the labiae extends nearly to the urethral opening. The author has never seen it in the newly born. The severe form may occasion much difficulty during micturition. Ascending infection may occur, with the usual signs of "pyelitis," but the urine is alkaline and of disagreeable odor. Drugs are of little help. Prompt relief follows the breaking up of the adhesions. This can usually be accomplished without the use of instruments. Recurrence must be prevented.

CLAUSEN, Rochester, N. Y.

Miscellaneous

THE EFFECTS OF ROENTGEN RAYS UPON THE KIDNEY. DAVID A. WILLIS and ALBERT BACHEM, Am. J. Roentgenol. **18**:334 (Oct.) 1927.

In twelve dogs a single kidney was exposed directly to doses of from one to seven human erythema doses of roentgen rays; a protective procedure was used to eliminate other organs. Autopsy was performed in from two days to seven months. There was progressive degeneration of the tubuli, with replacement of newly formed, connective tissue, but no regeneration of the broken-down tubuli. The glomeruli were practically unchanged except for reduction in size and a distortion secondary to other changes in the kidney. The destructive process is a reversal of the mechanism of chronic glomerular nephritis in that the tubular degeneration is primary and is followed by scar tissue formation, obliteration of capillaries and finally by glomerular atrophy. The contracted kidney thus produced is the end result of a nephrosis. The author includes a bibliography.

STULIK, Chicago.

UNINTENTIONAL CRUELTY TO CHILDREN. A. HYMANSON, Arch. Pediat. **46**:51 (Jan.) 1929.

The rôle of the physician as adviser to parents in the matter of discipline and in the efforts of parents to guide or instruct their offspring is discussed. The physician's counsel should be sought and occasionally it should be volunteered. The wisdom of careful individualization in the care and management of children is emphasized. All standardization of children contains within it the germs of cruelty and hardship, yet is necessary in all institutions whether eleemosynary, educational or correctional. Fashion and the tyranny of custom are responsible for much attempt at standardization outside of institutions. The outlook for any radical change is gloomy.

WILSON, Norfolk, Va.

THE PROBLEM OF CROSS INFECTION. MORRIS GLEICH, Arch. Pediat. **46**:59 (Jan.) 1929.

The admissions to the pediatric department of a hospital are divided into infected and noninfected cases. To the latter class belong the boarder-infant, the rachitic and marantic child, the premature infant, cases of malnutrition and infant feeding, congenital deformities and birth injuries. As a rule all infants are placed in a general ward. Soon some of the uninfected patients are infected, become ill and perhaps die. To place an infant with marasmus or improper feeding in a general ward or to allow a general ward nurse to care for uninfected patients at the same time is, in the opinion of the author, nothing short of criminal. The salvation of the problem lies in segregation in wards with cubicles as far as possible from the general ward. Individual rooms would be ideal. Every effort should be made to avoid cross-infections. If possible, admission of infants and children to a hospital should be discouraged. Isolation at home is far better.

WILSON, Norfolk, Va.

MAY RADIUM RETARD OR DIMINISH THE ACTIVITY OF THE INTERARTICULAR CARTILAGE? L. OMBRÉDANNE and M. T. COMBY, Arch. de méd. d. enf. **32**:505 (Sept.) 1929.

The commonly accepted theory that the interarticular cartilage is the chief factor controlling the length of bones is disputed. Among their arguments advanced to prove that this structure is not an osteogenetic agent, the authors point to the fact that in traumatic separation of the epiphysis the line of cleavage does not pass through the elastic conjugal cartilage but rather appears in the cushion of young bone interposed between the cartilage and the metaphysis. From this level there may be radiations, but they always extend toward the diaphysis and never toward the cartilage. Following such a lesion the cartilage remains inactive, and the center of osteogenesis, in the new bone just beneath, is called on to reconstruct osseous tissue. Similar phenomena are credited to the subperiosteal cushion which constitutes the osteogenetic center for the lateral growth of the long bones and which must be included in periosteal grafts. With these facts in mind, Ombrédanne and Comby question the indiscriminate use of radium and of roentgen therapy in the treatment for skeletal abnormalities in the very young. Recognizing the capacity of radium, for example, for retarding the development of neoplastic cells, may not this agent also inhibit the growth of bone cells when applied in the vicinity of a joint? Experimentation with young animals and the analysis of human cases seem to confirm this fear. Beclère maintains that similar conclusions are applicable with respect to roentgen rays, inasmuch as the Y radiations of radium possess practically the same properties, physical and biologic, and have the same therapeutic value as the roentgen ray, though differing somewhat in wave length. Perthes, in 1903, irradiated the wing of a pullet for forty-five minutes during the first few days of life; at the end of seven days, growth was permanently and totally arrested. Since that time many observers have reported studies bearing on the destructive action of radium and roentgen rays on young bony tissue, the German literature especially containing many interesting contributions. The authors report the case of an infant girl, normal in all respects at birth but presenting about the fifth month a tumor mass on the lower third of the right thigh. Believing it to be malignant the attending physicians had the tumor treated by radium over a period of six months. It developed later that the tumor was a lymphangioma; at the age of 8 the right femur was 1.5 cm. shorter than the left.

AMESSE, Denver.

PARISIAN CHILDREN SENT TO BOURBOULE BY THE ASSISTANCE PUBLIQUE. FERREYROLLES and GUILLOT, Bull. Soc. de pédiat. de Paris **27**:181 (March) 1929.

The authors review the results obtained during the past four years with about 2,000 children who were sent to Bourboule on account of malnutrition or for convalescence after some illness. Most of them showed gains in weight which were larger than the normal average gains for their ages and heights. In the small number of children who did not gain in weight or who lost weight while at the country home some abnormal condition, usually an intercurrent infection, explained the stationary or diminished weight. The children who gained weight after leaving the institution, retained it for the time during which they were observed and also continued to put on weight during this period. Most of them, however, were soon lost track of so that they could not be followed any further. The authors unhesitatingly recommend that the facilities for giving a period of country home care to those children who need it, be increased to meet the demands of Paris and its vicinity.

BENJAMIN, Montreal.

AN APPARATUS FOR THE STUDY OF BASAL METABOLISM IN THE INFANT. HENRI JANET and MADELEINE BOCHET, Bull. Soc. de pédiat. de Paris **27**:185 (March) 1929.

The child is placed into a rubberized silk bag which has an opening for the head. A bell-jar fits over the face into the collar of the rubber bag. There are

inlet and outlet tubes provided with safety-valves which allow air to pass in and out. By means of a small pump the air is driven into a gasometer for a standard interval of time. The air is analyzed for its carbon dioxide content, corrections are made for temperature and barometric pressure variations, and the basal metabolism is determined.

BENJAMIN, Montreal.

THE FIGHT AGAINST INFANT MORTALITY IN SWITZERLAND. P. GAUTIER and A. THÉVENOD, Le Nourrisson **17**:277 (Sept.) 1929.

The statistics in Switzerland show that the death rate during the first year of infancy fell from 15 per cent in 1900 to 8.4 per cent in 1920. The most common causes of death arranged in the order of their frequency are: congenital debility, acute gastro-enteritis, acute respiratory disease, tuberculosis and acute contagious diseases particularly whooping cough, which kills more young infants than all other acute contagious diseases combined.

The most vulnerable period for an infant is the first few days of life; the death rate is higher in male than in female infants.

The reduction of infant mortality has been obtained in three ways: (1) by the repression of abortions, and (2) by legislation which provides help for pregnant mothers during a period of several weeks before and after the birth of her child. This has brought about a decrease in the number of stillbirths. The third factor has been an educational campaign provided especially for girls while still in the secondary schools and for young mothers by Red Cross classes and through infant hygiene dispensaries and nurseries.

Much of the credit for the results accomplished belongs to the National Foundation "Pro Juventete" created in 1912.

MCCLELLAND, Cleveland.

THE MOVIE AND THE CHILD. LEROY, Rev. internat. de l'enf. **8**:704, 1929.

Physicians and educators agree that the growing child should develop in an atmosphere free from the major excitements which characterize the period. The normal stress at this season of transition is often more than sufficient to generate a neurosis that may continue into adult life. Picture shows, now so numerous everywhere, are well calculated to overload the mind of the child with experiences and sensations foreign to his training and surroundings; aside from the manifest danger of these early impressions on his moral make-up, there are physical effects to be considered, such as headache, eye strain, dizziness and disturbed sleep. The author believes that revolutionary changes must be made before parents can feel safe in permitting indiscriminate attendance on cinema performances. Aside from the startling character of many of the pictures, depicting crimes of violence and passion, the spectacles are entirely too long and the surroundings often unhygienic in the extreme. So-called "educational films" often prove wholly valueless, creating false notions in the susceptible mind of the child and nullifying individual imaginative and creative power. Leroy recommends remedial measures in the cooperation of the state, the film corporations and the public to the end that an entirely different type of pictures be prepared for the young.

AMESSE, Denver.

Society Transactions

PHILADELPHIA PEDIATRIC SOCIETY

Clinical Night, Oct. 8, 1929

RALPH M. TYSON, M.D., *President, in the Chair*

OUR CHANGING IDEAS ABOUT TEETHING AND TEETH. Presented by DR. JOSEPH HEAD.

"Teething is a natural process and assistance by lancing is unnecessary." This is the stock objection raised by opponents of this time-honored procedure, but it should be remembered that the same objection would hold with the same force against the assisting of nature with the forceps during parturition.

Many pediatric authorities maintain that retarded dentition is seldom, if ever, a cause of the bowel complaints and general nervous malnutrition so common among children during the first and second summers. It is also claimed that lancing forms scar tissue in the gums which retards later eruption of teeth and that many children suffering from colic, scurvy and other of the ordinary infantile ailments, have been uselessly submitted to laceration with a lancet, so that the child's pain was actually increased. If the child suffers from malnutrition, bowel disorders and restlessness, with resultant fretfulness or shrieking during its period of dentition, even though the gums appear to be normal, retarded dentition should be considered as one of the underlying causes. The pain of teething does not arise from the pressure of the tooth on the gum, but from the pressure of the gum on the tooth forcing it back on the underlying dental nerve. A single retarded wisdom tooth in an adult may cause such pain and nervous shock that the bowels will be violently disturbed and there will be high fever. These symptoms disappear when the entire grinding surface of the new molar is freed from its overhanging tooth capsule. Pressure of the tooth capsule on the posterior cusp alone may cause these symptoms, granting all the other cusps are free. The same condition has been noted during the eruption of the sixth and twelfth year molars. When a screaming, colicky, fevered infant is presented for treatment, with not only one but eight teeth pressing on the dental pulps, the physician cannot be too certain that retarded dentition may not be an underlying, exciting cause of all the trouble.

Unless the dental capsule covering the cusps of an erupting tooth is dissected clear of it so as to relieve the back pressure on the nerve, lancing may bring no relief. With wisdom teeth covered by a large mass of gum it is sometimes necessary to burn the capsule away with trichloracetic acid. The complete lancing of incisors and canines presents few difficulties to the expert, as the lancet can be readily passed all around the cutting edge of the tooth beneath the gum. As is often the case, four molars may be under suspicion at the same time with the teeth far under the gum. It is a question to decide how much surgery one is justified in performing on a sick child in the possibility of helping it. It is all the more necessary therefore that the possibility of systemic disorders arising from reflex dentition disturbances should be recognized, just as it is necessary that all infantile disturbances should not be attributed to faulty dentition.

The question of scar tissue formed by lancing has not been seriously discussed, as ordinarily the tooth erupts long before scar tissue can be formed; and if it does form, the great relief obtained by judicious lancing more than compensates for the necessity of a second, or even a third application of the lancet. Counter-irritants and teething lotions are of no value, as the source of irritation is not in the gum but deep in the alveolar process where the root tip presses on the uncalcified pulp. Decay is not of systemic but of local origin. Daily mechanical cleansing of the

teeth from their bacterial masses is the first and prime essential in the prevention of dental decay. The influence of heredity as regards good and bad teeth is very little. In Dr. Head's experience dental decay is equally frequent in white and colored children.

Abnormal serrations and furrows observed on the crowns of teeth are usually due to some acute disturbance of the epithelial tissue of the body, such as scarlet fever, that occurs during the formative period of the enamel of the tooth affected. If the disturbance occurs at the age of 1 year, it will usually show grooves on the six year molars and central incisors; at the second year, on the lateral incisors and points of the bicuspids; at the third year, the canines, second molars and perhaps the wisdom teeth will be marked. There will be less decay when coarse, hard, tooth cleansing food is used that requires mastication. Temporary teeth should be cleansed and preserved with the same care that should be given permanent teeth because decay and disease spreading abscesses are prevented. On the temporary teeth depends the beautiful and complete development of the facial profiles from the forehead to the chin, including each antrum and other important facial sinuses of the skull. If the room in the jaw occupied by the temporary teeth is lost or diminished, there will not be sufficient room for the permanent teeth, nor will there be proper absorption of the roots of the temporary teeth to allow the permanent teeth to slip easily and normally into their proper places so that a broad, beautiful dental arch will be formed. Teeth do not grow to fit the face; the face grows to fit the teeth. If the teeth can be made to assume the true, normal arch, the rest of the face develops in corresponding symmetry and beauty. It is most important that the pediatrician keep in active sympathetic cooperation with the dentist during the development and formation of the dental arches up to the age of 14 or more. Any lack of development in the body economy of the child should be the danger signal for them both. Teeth may be straightened, jaws mechanically expanded, but there will be no permanent result if the development of the child's jaws does not provide the normal bone and tissues to keep straightened teeth in position. It may sometimes be good practice for the dentist to stop temporarily any straightening of the teeth until the physician assures him that the child is sufficiently well for him to proceed with his work. In the meantime, the physician should examine the thyroids of the child to see that they are functioning properly. Ergosterol, cod liver oil, colloidal calcium, iodine or anything else of a suitable nature may be administered, but especial care must be given to the building up of the child with outdoor exercise and a healthful diet.

THE DIETETIC PROBLEM IN OBESE YOUNG CHILDREN. Presented by DR. BURGESS GORDON.

In a study of the factors which influence obesity in young children, it was found that habits of food consumption, especially the excessive intake of carbohydrates were more important than disturbances of the endocrine glands and basal metabolism. Certain data suggest that a failure in the storage of glycogen and a disturbance in the sugar regulating mechanism may influence the gain in body weight. A regimen consisting of a reduction in the usual total intake of starch (no change is made in the intake of fat and protein) and the administration of dextrose (30 Gm. daily) in divided doses between meals, was effective in reducing body weight. The indications for loss of weight and the importance of treating symptoms were discussed.

DISCUSSION

DR. RUSSELL S. BOLES: The thought that some disturbance in function of the endocrines is at fault in the endogenous type of obesity is based more on theory than on facts. In but very few patients, and in children most of these would comprise the Froehlich group, endocrine imbalance is not the primary etiologic factor. That it may be involved, however, is attested by the weight variations that occur during the preadolescent age and at the menopause. Dr. Gordon's objection, however, that obesity might be explained on this basis, I think,

is well sustained. His own observation agrees with mine, i. e., that in the majority of the patients he had studied there was an excessive ingestion of carbohydrates. If we knew the truth, we would consider any case, not due to this, as exceptional. It is true, we all have seen these exceptions. I sometimes think that chronic food intoxication must affect the patient's economy like chronic alcoholic intoxication. The analogy between the toper from alcohol and the one from food could be carried far. They both start out with the same earnestness of purpose to overcome their affliction. They are continually seeking the novelty of a new cure or a new diet, hoping that each one will offer a short cut in attaining what they desire not without too great a restriction of their appetite.

Occasionally, the handicap of heredity asserts itself in the child. It would appear that a family tendency toward obesity is not frequent and is rarely insurmountable unless the patient wishes to overcome it. The harmful habits that a child acquires are those of overeating, frequent eating and indolence. Probably, a more important heritage from an etiologic point of view is the nervous mechanism of the person. The fat child is happy and good natured. His brother or sister might eat twice the amount of food he does and yet weigh many pounds less. The same thing is seen in adults, and I believe the condition might be attributed to the variation in stability of their nervous systems. One meets just as much difficulty in reducing a fat person as in fattening a thin one. The one accumulates fat with placidity; the other burns it up with excitability. There is something more than a given number of pounds to think about when the question of reducing is considered.

This whole problem in the case of children should be approached with much caution. We are tampering with a personality, a delicate mechanism in a child, when we attempt to correct obesity. A reasonable degree of overnutrition is an asset to a healthy active child and unless the child is at least 15 or 20 per cent overweight, I believe as Dr. Gordon suggests that no attempt at reduction should be made. In children whose percentages of overweight are greater than this, some conservative method of reduction is in order. Personally, I feel indebted to Dr. Gordon and his associates for describing such a method.

BISMUTH USED EXCLUSIVELY AS THERAPY IN CONGENITAL SYPHILIS. Presented by DR. JOHN F. COPPOLINO.

This article appears in full in this issue, p. 288.

DISCUSSION

DR. CARROLL S. WRIGHT: I am pleased to hear Dr. Coppolino speak so favorably of bismuth in the treatment of congenital syphilis. For the past six years I have been using bismuth more than any other single remedy, in my Congenital Syphilis Clinic at the Graduate Hospital, where we treat from forty to sixty patients weekly. I find that it is well tolerated and most efficacious. It will cause the disappearance of surface spirochetes as quickly as forty-eight hours, and it will usually clear up a case of interstitial keratitis as rapidly as the arsenobenzenes; it is easily administered and rarely causes toxic symptoms.

In 1927, I reported at the meeting of the American Medical Association, on the results obtained in fifty-four patients with congenital syphilis treated with bismuth. While the majority of these patients had had previous arsphenamine therapy, I would like to review the statistics briefly. Forty-seven of these patients had late congenital syphilis and only four of these forty-seven cases showed a negative Wassermann reaction after an average of thirty injections of neoarsphenamine. A few had also had mercury in addition to the arsphenamine. Twenty of these forty-seven patients, or approximately 47 per cent, showed negative Wassermann tests after treatment with bismuth had been carried out for one or two years. While I realize that Dr. Coppolino has used bismuth exclusively in the series of cases which he presented, in order to determine its value, I do not believe that we will ever be able to treat patients with syphilis with a single drug. The spirochete

tends rapidly to adapt itself to any one drug. For this reason, alternate courses of an arsenobenzene and some other drug give the best results. I believe that the best drug to use as an adjunct to the arsenobenzes is bismuth.

CHICAGO PEDIATRIC SOCIETY

Clinical Meeting, Children's Memorial Hospital, Oct. 15, 1929

JOSEPH BRENNEMANN, M.D., *Chief of Staff, Presiding*

TORTICOLLIS AND INFECTION. Presented by DR. BERKHEISER.

Recently we had an interesting group of patients with stiffness and deformity of the neck associated with some of the acute infections, and without trauma. Torticollis had developed due to a definite dislocation of the atlo-axial joint.

CASE 1.—Roentgenograms in the first case showed a definite difference between the atlo-axial articulations on the two sides. In the lateral view, there was little to be seen except that the atlas projected a little further forward than in the normal.

CASE 2.—This patient (shown on a Bradford frame with traction on head) was admitted to the hospital on September 5. The roentgen interpretation was difficult and obscure until on September 24, when one could see (slide) that there was a normal articulation on one side and on the other the joint space was not visible, although the results of successive roentgen examination have shown more nearly normal relations.

CASE 3.—This child, wearing a plaster collar, presented herself at the hospital on August 12 with the same condition as that of the patient in case 2. The atlo-axial articulation was definite on one side and on the other it could not be seen. On August 20, both articulations appeared normal.

CASE 4.—This child (shown with plaster collar) came to the hospital during December, 1928, at which time roentgen examinations presented considerable difficulty in diagnosis. The posterior spine of the atlas was displaced far forward and against the occiput in the lateral view. The anteroposterior view taken through the open mouth presented the appearance of a large circle, and the other structures could not be differentiated. This circle was variously interpreted, but it must have been that of the neural canal of the atlas. Later views show the forward bilateral dislocation with gradual return to normal on May 6. The patient remained in the hospital for a long time because the dislocation had been present longer than that of the other patients and because we feared that her reduction would not be maintained.

These patients received the same course of treatment, i. e., gradual, constant traction in hyperextension, until the reduction was accomplished, and then a plaster collar was applied. Although there was a marked dislocation in the case of the last patient, there was no abnormal neurologic signs in any of the patients.

In regard to the etiology, there had been no trauma but there had been an associated acute infection in each case. One patient had acute rheumatic fever, the second, scarlet fever and diphtheria, a third, acute tonsillitis and the fourth a severe "acute cold." We feel that these conditions resulted from an acute infectious arthritis, which caused a weakening of the joints from relaxation of the ligaments, and that muscular spasm caused the torticollis.

CALVÉ SYNDROME. Presented by DR. CHARLES PEASE.

CASE 1.—This boy was not treated orthopedically, and the large head can be seen extending out of the acetabulum, with a tendency to coxa vara.

CASE 2.—This boy came to the hospital a year ago with a marked flat head, and here (presenting film) is a picture taken afterward showing reformation of

the head of the femur. The boy will obtain perfect function in his leg. We treat these children by placing the leg in extreme abduction and applying a plaster cast for six months, after which we adduct to a normal position.

CONVULSIVE UREMIA IN CHILDREN. Presented by DR. C. A. ALDRICH.

Four years ago, in discussing edema and its possible function as a means of diluting toxins, I stated that we thought it inadvisable to restrict fluids in nephritic patients regardless of the extent of their edema, and implied that I had done considerable harm in some patients by this method of treatment. Since that time, I have seen no reason to change this attitude. Especially is it felt that with impending or established uremia, fluids should be forced in every way possible. Since we have employed this method of treatment of patients with nephritis, we have had seventeen patients with threatened uremia in the course of their disease. None of these have died in convulsive uremia, and all but one (who had renal infantilism) are alive today. There were previously on my service, nine patients treated by restriction of fluids, hot packs and cathartics. Of these, four died in uremic convulsions, one died two weeks afterward, still on restricted fluids, and four are alive and well. I thought it worth while to outline our preventive and therapeutic measures and to show some illustrative cases. It is to be remembered that we are not speaking here of the true, nonconvulsive or acidotic uremia, which condition is terminal and not amenable to any method of treatment of which I know.

Prophylaxis.—If a patient with nephritis develops a blood pressure of more than 130 associated with vomiting, headache, a stupor, coma or visual disturbances, he is considered to be in a state of threatened uremia of the convulsive type. Hypertension is always present in this condition. Fluids are forced by every possible avenue, and magnesium sulphate, saturated solution, in doses of from 1 to 3 ounces (30 to 89 cc.) daily, is administered by mouth, even in the case of small children. If the symptoms persist, a spinal puncture is done to relieve the intracranial tension, and this fluid is practically always found to be under marked pressure. The administration of magnesium sulphate is continued by mouth until the systolic pressure remains below from 120 to 115, and after that it is discontinued. Fluids are still given in large quantities. Hot packs and sweats are not given to any children.

As a method of preventing convulsions, we feel that this is satisfactory, for on this management only one child has had convulsions and uremia developed in this one after we had discontinued the administration of magnesium sulphate, as will be shown later in the case report. In edematous patients, these doses of magnesium sulphate do not produce diarrhea. I have no explanation for this phenomenon, unless it be that since the tissues require it, they absorb the drug.

Treatment of Attack.—If the patient is in convulsions or a state of coma, or is vomiting so that the administration of fluids by mouth is impossible, a spinal puncture is immediately done. If this does not give immediate relief, intravenous hypertonic solutions are administered. We have found magnesium sulphate in a 2 per cent solution to be the safest and most rapidly effective one to use, although at times we have used 50 per cent dextrose, 5 per cent magnesium sulphate, 5 per cent sodium bicarbonate, 5 per cent sodium chloride and 6 per cent dextrose Ringer's solution. The hypertonic magnesium sulphate should be given slowly over a period of from one-half to one hour, and should be given until the blood pressure shows that it is definitely dropping. Lowering of blood pressure has always taken place following administration of this solution, and with the drop in blood pressure the symptoms subside. As soon as the patient can retain it, a saturated solution of magnesium sulphate is given by mouth and other fluids are forced.

Intravenous medication of this sort has been given to seven patients, all of whom recovered promptly from the attack. In no instance has the intravenous treatment failed to cause a drop in pressure coincident with relief of symptoms. On the other hand, four of the nine patients not treated in this manner died in convulsive uremia.

CASE 1.—R. W., a boy, aged 5 years, entered the hospital Sept. 5, 1929, in a semicomatose state with a blood pressure of 138 systolic and 76 diastolic; hematuria, albuminuria, cylindruria, moderate edema and a discharging right ear, which had bothered him for two months. Magnesium sulphate, 1 ounce of the saturated solution, was given by mouth daily, fluids were forced, and the patient was kept warm in bed. Three days later, because of a blood pressure of 154 systolic and 100 diastolic and visual disturbances, a spinal puncture was done, following which the blood pressure dropped to 128 systolic and 90 diastolic. The symptoms gradually left, and the magnesium sulphate was discontinued on the seventh day. The patient is entirely well today with no evidence of kidney disease.

CASE 2.—E. B., a girl, aged 11 years, entered the hospital on Jan. 24, 1929, her condition having been diagnosed as acute appendicitis. She was acutely ill, vomited coffee ground material and was in severe abdominal pain. There was a urinous odor to the breath, active reflexes with sustained ankle clonus; blood pressure of 174 systolic and 130 diastolic, and the urine showed albumin, blood and casts in large amounts. During the afternoon she developed headache, dizziness, blindness, and gradually became comatose. A spinal puncture was done, and following this 50 cc. of 50 per cent dextrose was given intravenously. The blood pressure dropped to 140 systolic and 110 diastolic, and the symptoms were somewhat relieved, but at 6 a. m. she developed a blood pressure of 185 systolic and 130 diastolic with generalized convulsions. The administration of dextrose solution was repeated, and since the symptoms were not sufficiently relieved, this was followed by 150 cc. of 2 per cent solution of magnesium sulphate intravenously. The convulsions stopped immediately, and the blood pressure was 142 systolic and 122 diastolic. The child was still dopey but we were able to administer magnesium sulphate by mouth from then on, 2 ounces (59.2 cc.) three times during the day. By afternoon, she was bright and responsive. Fluids were forced, the magnesium sulphate was continued and her recovery was uneventful. Three weeks later, she had another attack of vomiting with hypertension which passed off after the administration of magnesium sulphate by mouth and one spinal puncture. This patient, as one can see, is not completely well yet. She has chronic glomerular nephritis.

CASE 3.—B. J., a girl, aged 10 years, entered the hospital on Feb. 7, 1929, in a state of coma following a convulsion. Her face was puffy and there was a slight edema elsewhere. She had a bilateral, lateral nystagmus, sluggish pupils, inflamed tonsils and a systolic blood pressure of 150. The urine showed traces of albumin and blood. One ounce of magnesium sulphate was given by mouth, and 400 cc. of salt solution was given under the skin. The next morning 50 cc. of 50 per cent dextrose solution was given intravenously. The blood pressure dropped to 135 systolic and 70 diastolic, and we were able to administer fluids by mouth. The child made a gradual, uneventful recovery, but magnesium sulphate was continued for seven days when the blood pressure was 105 systolic and 80 diastolic. She has now, as you see, recovered.

CASE 4.—R. C., a girl, aged 7 years, entered the hospital May 5, 1927, in a semicomatose state. This condition had been present at home eight days previous to entrance when she had had convulsions, anuria and high fever with a discharge from the ear. The blood pressure was 130 systolic; she was blind and could not talk, and the pupils were dilated and did not react promptly. Magnesium sulphate was given by mouth for two days, and fluids were forced. The blood pressure and all the symptoms subsided in three days. She also is well today.

CASE 5.—B. P., a girl, aged 11 years, was presented on Aug. 8, 1929, two weeks after a sore throat with edema had developed with hematuria, vomiting and pain under the sternum. The blood pressure was 160 systolic and 100 diastolic. A solution of magnesium sulphate was given by mouth and fluids were forced. In two days the blood pressure was 130 systolic and 72 diastolic, and the symptoms were so much better that the magnesium sulphate was discontinued. Two days later, however, she vomited, became dizzy, and had continuous convulsions with

a rise in blood pressure. Spinal fluid was drawn under marked pressure, but since this did not stop the seizures, 200 cc. of magnesium sulphate was given intravenously. This stopped the convulsions, and the blood pressure dropped to 110 systolic and 90 diastolic. One cubic centimeter of 50 per cent magnesium sulphate was given intramuscularly and 250 cc. of 10 per cent dextrose solution was administered by lavage. This was given because she was anuric. The next day she was somewhat better and had no convulsions, but a spinal puncture was done because of visual disturbances and headache. The magnesium sulphate and administration of fluids were continued for about two weeks because the blood pressure tended to remain elevated. The child is now entirely well and about to be discharged.

Prognosis.—I am anxious to make one more point about convulsive uremia, and that is that its presence should influence the ultimate prognosis only because of the immediate danger in which it places the patient. The commonest mistake of my intern is to make the diagnosis, chronic nephritis, because of uremia of this type. As a matter of fact, convulsive uremia is more common in acute hemorrhagic nephritis than in other types. The prognosis should depend on the diagnosis as to the type of nephritis rather than on the presence or absence of convulsive uremia. Four of these five children are entirely and permanently well; the other one has an incurable disease, glomerular nephritis. In the differential diagnosis of these two types at the time of admission, the most important point to remember is that acute hemorrhagic nephritis always follows an acute infection of severe type, whereas glomerular nephritis, at least in my experience, seldom is accompanied at the onset by any such infection. The prognosis, therefore, as to ultimate outcome, should be in inverse proportion to the evidence of acute infection present or immediately antecedent.

EMPYEMA. Presented by DR. E. T. MCENERY.

CASE 1.—A boy, aged 3, entered the hospital with empyema of one year's standing. Physical examination showed marked deformity of the right side of chest, with a flat percussion note and absence of breath sounds over the whole right side, and with the heart displaced slightly to the left. Cough was productive of foul smelling pus. An abscess of the lung was considered and the bronchial tree was injected with iodized poppy seed oil 40 per cent, which failed to show any evidence of an abscess. The pleural cavity was aspirated and 50 cc. of hemolytic streptococcic pus was obtained. Successive roentgenograms showed the progress of the disease, and demonstrated what can happen in chronic conditions of the chest, even in those of long standing. Deformity of the chest was absent and the results of physical and roentgen observations were practically negative.

CASE 2.—A boy, aged 6, entered the hospital with definite signs of pneumonia of the right lung, followed by empyema. Pus was aspirated to the amount of 2.5 liters. During his stay in the hospital the patient developed measles, scarlet fever, diphtheria and a frontal sinus infection, all of which made his recovery slower. The successive roentgenograms again showed the progress of the disease, and were similar to those in the preceding case. This boy now has a practically healthy lung.

CASE 3.—This child was first presented when 4 months old, because of slight twitchings of the left side of the face. The fontanel was full but not tense. Large doses of calcium lactate controlled the twitchings, but they recurred when medication was stopped. The previous history, which was of importance, was that while in the hospital after delivery, the child developed a furunculosis of the scalp, the mother a breast abscess and the nurse a boil on the chin. At 5 months of age, the twitchings were more extensive, involving the left side of the face and right extremities. The head had increased in size, and the fontanel was definitely bulging. A diagnosis of hydrocephalus was made, and the child admitted to the hospital for observation, to rule out an obstructive or nonobstructive hydrocephalus. A neutral dye was injected into the right ventricle but was not recovered from

either the left ventricle or spinal canal. A ventriculogram showed a definite obstruction between the left and right ventricles and spinal canal. An attempt was made to outline the left ventricle by injection of air but on inserting a needle to a depth of 2.5 cm. pus was obtained which on culture showed *Staphylococcus aureus*. Over 250 cc. of pus was removed by aspiration. Dr. Loyal Davis trephined the parietal bone and drained an abscess which contained 300 cc. of fluid. The child had an uneventful recovery. He was slightly spastic on the right side but was using his arm and leg better every day. Mentally, he was alert, playful and happy four months after operation.

Abscess of the Brain. Presented by Dr. Boot.

A girl, aged 11 years, was admitted to the hospital on September 25, with a history of head cold, left-sided earache and discharge from the left ear for several days. When admitted to the hospital, she was lying very still with eyes closed and did not notice anything around her, but could be easily aroused. She was seen by several members of the hospital staff and opinions varied as to whether it was a case of encephalitis, meningo-encephalitis or brain abscess. At that time, she had some stiffness of the neck and a little general weakness. On sitting up, she became dizzy and vomited. The left ear showed a little redness along the manubrium; the drum membrane was white. There was no tenderness over the mastoid. A roentgenogram made at that time showed the left mastoid rather hazy and indefinite as compared with the right. I did not think there were enough symptoms about the ear to justify operation, and thought there was some involvement of the cerebellum. I did not see the child again until October 5 and at that time she was brighter and answered questions promptly, but there was a marked Kernig sign and horizontal nystagmus on looking to the right or left. Nystagmus developed at about the same angle on looking in either direction so it was a physiologic condition. When tested for past pointing, she had great difficulty in touching the nose with the right hand. There was apparently weakness and lack of tone in the muscles. On the strength of that, a choked disk and vomiting, along with headache, I made a diagnosis of a lesion involving the left hemisphere of the cerebellum.

At operation, we found almost a normal mastoid, with no free pus. I uncovered the lateral sinus, which was a little reddened. I removed the bone behind the sinus and there was considerable bleeding. I packed, to control the bleeding, and in this process the packer slipped between the dura and the pars petrosa and at least a half an ounce of yellow pus gushed forth. After that I passed in a director and obtained more pus. I then put in a small rubber drain and dressed the wound. The next day there was a marked paresis of the left side, and nystagmus to the left. Apparently the auditory nerve had been slightly injured in placing the drain.

The child's temperature has been around 100 F.; her pulse was down to 52 before operation; afterward it rose to above normal but within the last two days it has been down to 72 and today to 64. She has vomited two or three times today, and says she feels sick. I expect there is some recurrence of pus and I will search for it after we complete treatment.

I neglected to state that on admission a lumbar puncture showed 55 cells, and on September 26 there were 2,400 cells. From that time on, the cells decreased in number, and on two occasions we could not obtain any spinal fluid at all.

Note.—Later, on dressing the wound more pus was found deep between the dura and the pars petrosa. By November 17, the patient had completely recovered.

Defects of Speech. Presented by Dr. Perlowsky.

The special significance of defects of speech to the physician should lie not in telling the mother that the child will outgrow the defect, nor in performing a tonsillectomy with the vague hope that the speech defect will disappear, nor in

the prescribing of a drug, but in understanding that the correction of even a minor speech defect may be of life-long value in an increased effectiveness of utterance and the resultant increased happiness of the individual.

A defect of speech may be defined as any variation from an accepted speech standard so extreme as to be conspicuous, confusing and unpleasant.

In such a limited period there can be only a brief introduction to the general type of speech problem handled at the Children's Memorial Hospital. For convenience, classification considers only the nature of the factors involved.

Those speech defects originating or due to a malformation, disease or trauma of the speech mechanism are classified as organic defects. These include such defects as: nasality, hoarseness, aphonia and tongue tie.

There are problems for the surgeon here, the laryngologist and the speech specialist. Mothers so frequently are dissatisfied after a cleft is closed surgically, for the voice remains the same. Associated with this defect is the oral inaccuracy. There are so many consonants a child cannot pronounce. It is then that there is a need for the speech specialist. In operations on the speech apparatus, the consideration of the resultant speech sound and equality reverses the ordinary indication of nasopharyngeal operations.

Dyslalia, commonly called baby talk, is a result of erroneous interpretation and production of sounds. If it occurs in a normal environment, a weak coordination exists between the auditory word center and the motor production of sounds.

Delayed development of speech may be due to deafness, mental deficiency, psychic disturbance, and interference in the motor coordination in left-handed children.

Sigmatismus, simplex or lateralis, two forms of lisping, are usually due to the retention of infantile phonetic habits accompanied by infantile emotional habits. Rarely are defects caused by abnormalities of the teeth or palatal arch.

Stammering and stuttering are used interchangeably although by derivation stuttering refers to difficult labored speech and stammering to mispronounciation.

It is generally agreed that stammering is a defect of coordination disturbing a highly complex series of movements. It is based on a mental conflict and associated with nervousness of marked degree. It is caused by mental shocks and although primarily a mental affliction, physical factors may aggravate it. Treatment may be considered under two general captions, psychotherapeutic or reeducational. The first considers mental hygiene and aims to determine the nature of the mental conflict. Suggestion is useful in buoying up the self-confidence of the stammerer. The reeducational approach tends to direct the stammerer's attention to the mechanics of his speech mechanism, which in turn breaks down the muscle spasticity.

Corrected speech prevents a person from becoming unhealthy and prevents interference with his educational, professional and business success and social happiness.

Hence it is most desirable and necessary that there be evoked a general application of attention to the problems, and that concerted, systematized effort in the home, school and family physician's office be directed toward the intelligent understanding and guidance of the child handicapped by defects of speech.

MACROGLOSSIA. Presented by DR. JOSEPH BRENNEMANN.

A child with an enormously enlarged tongue, was sent to the hospital from Fort Wayne by Dr. Carlo. According to the history, when she was 5 weeks old an operation was done for a ranula on the right side of the tongue. During the next two or three years the tongue varied in size, not being much above normal. About a year before presentation, the patient's home physician saw her and found the condition about the same as when the child was sent to the hospital. The tongue gradually decreased in size and remained much smaller for a considerable period of time. When she was brought into the hospital there was a brownish,

watery fluid drooling from the mouth, especially when the tongue was lifted over. The tongue lay on the lower teeth, and there was an ulcer wherever it rested. It protruded almost 4 inches (10.16 cm.) and was about 2 inches (5 cm.) wide and 1 inch (2.5 cm.) thick. The condition was doubtlessly a true lymphangioma.

As to treatment, at first we applied wet compresses to hold the tongue up, and then we gave a few roentgen treatments, but there was no marked effect. We are now trying radium with some results. If the tongue does not decrease in size it will be necessary to remove part of it. The child is perfectly comfortable and hears and sleeps well.

SYPHILIS OF THE BONE AND ENCEPHALITIC REACTION TO SULPHARSPHENAMINE. Presented by DR. ROSENBAUM.

This child was first seen in February, 1927, when she was 8 years old. She was brought to the clinic because of inability to extend the left forearm. She was the seventh child, and there were seven other living children apparently well; the first died at 7 months of age while the family was still in Italy. The cause is not known. The mother was the only other member of the family who has any evidence of syphilis. She had a positive Wassermann and Kahn reaction.

When first examined, this child was 42 inches (106.68 cm.) in height, which is markedly undersized even for a short Italian child of this age. Her face and head were squarish, and the nasal arch was sunken; there were nebulae in both corneas and blepharitis. The teeth were of typical Hutchinson type and she had saber shaped tibias. The left cubital region had a bony swelling, and the forearm could not be extended more than 90 degrees. Roentgenograms showed areas of increased penetration, and also new bone formation.

Other bones were also involved and the thickened periosteum, and areas of increased penetration with widened, serrated epiphyseal lines could be made out in the roentgenograms.

Response to treatment was prompt, and within a few weeks definite improvement was evident which continued until there is at this time, good function. Treatment was begun with sulpharsphenamine, however, and three days after the third injection the child had a convulsion lasting twenty minutes. This was followed by a deep sleep and another convulsion the following day. We gave no more treatment with any of the arsenicals for we felt that this was an encephalitic reaction which may occur as a complication with any of the antisyphilitic arsenicals. She had never had a convulsion before this time and has had none since. This sort of reaction may be fatal in twenty-four hours with postmortem observations of hemorrhagic encephalitis and wet brain, or it may be as fortunate as the present reaction. Some authorities give this as the most frequent cause of death after treatment with arsphenamine. Epinephrine should be used and repeated, and sodium thiosulphate should be given.

TUBERCULOSIS. Presented by DR. HAMILL.

A boy, aged 10 years, came to the hospital a month before writing with a history that in December he was dismissed from school because of a rasping, ringing cough. In January, the upper part of his abdomen began to swell becoming progressively larger. For a month before his admission to the hospital, he had been losing weight and becoming paler. There was no subjective symptom.

Physical examination showed a few palpable, shotty glands in the neck; widening of the mediastinal dulness, and on auscultation of the chest, there was bronchophony and tubular breathing over both bases, with huge breath sounds. Palpation of the abdomen revealed a large, hard tumor mass extending over the right flank; at the level of the umbilicus was a softer tumor mass in the region of the spleen. The larger mass was firm and nodular, and has remained about the same size. At different times we have thought there was fluid in the abdomen. Pyelographic study by Dr. Kretschmer showed a normal kidney pelvis, and although the kidney was ptosed it was not thought to be enlarged.

Laboratory examination showed a large amount of albumin, 3 or 4+, in the urine but no red blood cells or casts. The white blood count was 16,000, with a relatively normal red count. The hemoglobin was from 50 to 65 per cent. The Wassermann, Pirquet and Mantoux tests were negative, as was the chemical examination of the blood.

Roentgenographic examination of the chest showed a dubious mottling of the parenchyma of both lungs. Opinions varied as to whether this was a metastasis or an inflammatory process. The heart shows no dulness and no murmurs are heard.

In view of this difference of opinion, I wish to present roentgenograms from three cases that have come to necropsy during the past year.

The first is that of a boy, aged 5, who died five days after admission to the hospital. For a year preceding his admittance, he had slight swelling of the abdomen. Two weeks before admission, the swelling rapidly increased, and for two days he had been having pain and vomiting. Physical examination on admission showed palpable glands in the neck, three discrete palpable tumors in the abdomen, not connected with the liver, and widening of the mediastinal dulness.

Necropsy showed a primary lymphosarcoma, with metastasis to the mediastinal lymph glands, the mesenteric and cervical glands. There was no metastasis in the lungs, but bilateral bronchopneumonia was present when the roentgenogram was made.

The second case was also that of a boy, aged 5, with necropsy ten days after admission. According to the history, the child had had difficulty in breathing for two years, and two weeks before admission this difficulty had become pronounced. When admitted, he was very cyanotic and an intubation was done to relieve the obstruction to breathing. Necropsy showed a ganglionic neuroma of the sympathetic nerve, which compressed the lung and pushed the trachea to the right. Many abscesses were present, and bilateral bronchopneumonia.

The third case was that of a girl, aged 11, who was admitted to the hospital three weeks after a malignant teratoma was removed with the right ovary, at which time there was said to be no sign of metastasis. At necropsy, the most striking thing was absence of metastasis in the remaining ovary; it was confined entirely to the right structures. The lungs were entirely clear of any gross pathologic process.

As to the treatment in the case presented, we have been at a loss as to what to do. If the primary tumor is retroperitoneal, with metastasis to the lung and liver, deep roentgenotherapy is contraindicated because of the destruction of liver tissue, and for metastasis of the lungs it would be of no value. Laparotomy has been suggested, but will not be carried out at present.

PULMONARY TUBERCULOUS INFECTION. Presented by DR. JOHN A. BIGLER.

CASE 1.—I wish to recall to your attentoin this patient whom I presented a year ago with a peculiar type of pulmonary infiltration. The boy, a Mexican, came under observation two years ago with a marked deformity of the spine. Physical examination at that time revealed no pulmonary changes of note, but the roentgenogram of the chest taken on admission showed areas of increased density resembling a miliary tuberculosis although there were no symptoms. Since that time a series of roentgenograms of the chest have been taken which have shown the same degree of shadows until recently when the densities began to disappear so that at the present time the pulmonary fields are practically clear, although the mediastinal shadow is very wide and there is evident calcification in the hilum of the left lung. There have been no definite physical signs at any time. The shadows have been much larger than those seen in cases of miliary tuberculosis, but there has been the same widespread distribution to the periphery of the lung fields.

As to diagnosis, the conditions to be considered were miliary tuberculosis, unresolved bronchopneumonia, or chronic tuberculous bronchopneumonia. We have felt from the first that the condition was chronic tuberculous bronchopneumonia, and in the course of the later events feel that this is most likely the correct diagnosis. The tuberculin reaction is very positive, and the Wassermann reaction is negative.

CASE 2.—This child was admitted to the hospital in January, 1929, with signs of pneumonia of the right upper lobe. The tuberculin reaction was very positive. The diagnosis was lobar pneumonia with the possibility of an associated empyema. The temperature dropped to normal within a few days and has remained normal, but the pulmonary condition remained unchanged. Since first seeing the child, we have obtained a series of roentgenograms of the chest which showed no change in the consolidation until about one month ago, at which time the shadow began to clear up from the periphery and it is now practically clear to the hilum. Four weeks ago, the patient returned with a phlyctenular conjunctivitis which has now about disappeared. The last roentgenogram of the chest shows the outer two thirds of the right upper lobe about clear, a right interlobar line and a marked enlargement of the right hilar and mediastinal shadow. Because of the course of the illness, the markedly positive tuberculin reaction, the large hilar shadow and the clearing of the shadow from the periphery, we feel that the condition is an epituberculosis. This particular type of tuberculosis is one in which there is not a direct invasion of the pulmonary tissue with the tubercle bacillus, but the consolidation is due to a toxic reaction. It usually has a course of months, is confined to one lobe and spreads out from the hilum that contains tuberculous caseated lymph nodes.

Book Reviews

ENCEPHALITIS IM KINDESALTER. VON PROFESSOR DR. A. ECKSTEIN, DÜSSELDORF. Paper. Price, 12 Rm. Pp. 172, with 56 illustrations. Berlin: Julius Springer, 1929.

This is a reprint of Eckstein's article in volume 36 of *Ergebnisse der inneren Medizin und Kinderheilkunde*. It is a demonstration of the shift of interest during the last two or three years from the epidemic to other forms of encephalitis. Only twenty-eight pages are devoted to the acute and chronic epidemic forms, while eighty-two are given to postvaccinal encephalitis. In his discussion of the epidemic disease, the author closely follows the lines laid down in Felix Stern's large monograph. He calls attention to the difficulty in recognizing the prodromal stage in infants, to the resemblance to tuberculous meningitis and to the occasional occurrence in children of an obstinate insomnia lasting for months following a brief and mild epidemic state. The pure epidemic form is relatively uncommon in children as compared with choreic and myoclonic forms. He dwells on the alterations of character in the chronic forms and on the lack of relationship between their severity and that of the acute stage. Then follow chapters on the epidemic occurrence of other forms, and on sporadic encephalitis. The types following measles and chickenpox are fully discussed and considered as more likely to be caused by the respective viruses themselves than to activation of some other virus by these diseases. Attention is called to the clinical and histologic differences from the epidemic forms. The changes in the brain responsible for the convulsions often complicating whooping cough are usually toxic degenerative encephalitis while hemorrhages attributable to paroxysms of cough are extremely rare. Encephalitis from scarlet fever is rare, and, unlike the other postinfectious forms, it has not become more frequent in recent years. The postvaccinal encephalitis is discussed at great length on the basis of the ninety-two cases so far reported in Germany. It is actually rare. In 1928, between 2,500,000 and 3,000,000 people were vaccinated in Germany, and there were only twenty-eight cases of this complication. The efficiency of the universal vaccination was demonstrated by the occurrence of only two cases of smallpox in the whole country. The mortality rate for postvaccinal encephalitis in Germany was 34 per cent, and in Holland 30 per cent. No age is exempt, and Eckstein considers the suggestion worthless to have children vaccinated earlier than is customary now. The complications could not be traced to any particular kind of vaccine. Attention is called to the resemblance of the histologic picture with prominence of demyelinated areas to that of disseminated encephalitis, and so-called acute multiple sclerosis. That the vaccine virus itself is the cause of the encephalitis is rendered probable by the transmission of vaccinia from the brains in fatal cases in human beings to animals, and subsequently these animals were immune to vaccinia.

In view of the overwhelming literature on encephalitis during the last ten years, the reviewer is not inclined to blame the author for relying mainly on German sources, especially as he appears to be well informed about the more important contributions from other countries.

THE ADOLESCENT. HIS CONFLICTS AND ESCAPES. By SIDNEY I. SCHWAB, M.D., Professor of Clinical Neurology, and BORDEN S. VEEDER, M.D., Professor of Clinical Pediatrics, Washington University Medical School. Pp. 358. New York: D. Appleton & Company.

The first three chapters were written by Dr. Veeder. He discusses growth from a general physiologic standpoint as well as the influence of glands of internal secretion, especially sex glands, differences in sex and the influence of the physiologic changes at puberty on mental attitudes and the capacity to do physical and mental work. The remainder of the book is written by Dr. Schwab, who approaches

the problems of adolescence from a psychiatric standpoint. "Adolescence from the point of view of this book is that period in the life cycle which represents impulses toward conscience social adjustment and the overcoming of conflicts, which naturally arise, by their final molding in sets of habit patterns." Adolescence is considered from the standpoint of physical growth, emotional expansion and glandular activation. Instincts are defined, and the conflict between instinctive impulses and the increasingly more complex norms of society are fully discussed. Adolescence is considered as an educational, religious and industrial problem. The great influence that sex has on conduct, personality development and general behavior makes up a large part of the book. The results of improper or impossible adjustment of the adolescent to his environment with his methods of escape are described. Finally, the writer gives a brief résumé of the whole problem of sex in the light of present knowledge.

The book is characterized first by a broad point of view of the whole problem of sex. The child is considered from both a physical and a mental standpoint; both authors are conservative; they have not confined themselves to a single school of thought but have attempted to approach the problem from as many points of view as possible; the book contains much constructive criticism; it contains an unusually large amount of common sense, and it is lucidly written and free from technical terminology.

The book should be of interest to any one dealing with older children and is safe to prescribe to parents.

TEN YEARS OF HEALTH-AID TO THE ORPHANS OF THE WAR. By PAOLO IACCHIA, Director of the Hospital for the Orphans of the War at Trieste. Pp. 123. Bologna: L. Cappelli, 1929.

This book is a report of the work done by a Medical Center for aiding the War Orphans of Trieste; there are a hospital, an outdoor department and summer colonies in the hills and on the seashore. Statistics are given as to the number of patients and types of diseases observed and treated, etc.

Considerable attention was paid to actinotherapy, 8,060 such treatments being given in 1928.

"Autovaccination," with material — sputum, nasal and vaginal discharges, pus, sediments in the urine and spinal fluid, as well as bacterial cultures — which had been irradiated with ultraviolet rays, was used in 192 cases. When the material was tuberculous, or from skin lesions, intradermal injections were given. In other cases subcutaneous or intramuscular injections were given. The author feels that he gets good results from this method of therapy in about 50 per cent of his cases of pulmonary tuberculosis, and in about 75 per cent of cases of non-tuberculous pulmonary disease; he felt that he obtained unfavorable effects in only five cases (four of pulmonary tuberculosis and one of bronchitis). Good results were also obtained in furunculosis, but no results in gonorrhea or otitis media.

Autoserum therapy (injection of serum obtained from cantharides vesicles) was of some value in arthritis. Serum from another patient convalescent from the same condition was tried frequently in different diseases with some success, especially in pneumonia.

Of 3,152 orphans recorded, 422 had some form of tuberculosis, 227 cases being pulmonary, 118 glandular, 29 of bone or joint and 6 peritoneal. One hundred and eighty-four orphans were regarded as anemic, underweight and predisposed to tuberculosis.

SÄUGLINGSPFLEGE: VORTRÄGE FÜR PFLEGERINNEN UND MÜTTER. By OBERMEDIZINALRAT DR. GUSTAV RIETHER. Fifth edition. Price, 4 marks. Pp. 136. Vienna: Franz Deuticke, 1930.

This booklet is a concise and more or less thorough guide for the instruction of mothers and nurses in the care of infants and young children. Breast feeding is quite adequately treated, and this chapter is probably the best in the book.

Since the author is a Viennese, artificial feeding is computed entirely according to von Pirquet's new system. A special chapter on diseases to which infants and young children are subject is complete and well done considering the size of the book. Some of the omissions are of especial interest, no mention being made of the use of cod liver oil or irradiated ergosterol in the prevention of rickets. Fruit juices are advised at the fourth month, but they are all lumped together as of equal value. Cereal is added to the diet at the seventh month, with the implication that if given earlier some danger to the child is involved. Mention of the use of toxin-antitoxin or toxoid mixtures for active immunization against diphtheria is also omitted; otherwise, the book is authoritative and can be recommended.

LE RACHITISME, ÉTIOLOGIE, PATHOGENIE ET TRAITEMENT. By A. B. MARFAN. Price, 15 francs. Pp. 52, with 6 illustrations. Paris: Gaston Doin, 1929.

The author of this short treatise was, until his recent retirement, professor of pediatrics at the University of Paris. He is well known for his studies on rickets and diseases of the bones. In this exposition, Marfan reviews the subject of rickets in the light of recent investigations and discoveries. He considers the importance of light and of irradiated substances, more especially in relation to the pathogenesis than to the cure of rickets. In regard to the etiology, he maintains the point of view that he has held for many years, namely, that syphilis is one of the most important exciting causes of this disorder. In general, he believes that rickets is brought about by chronic infections or intoxications which gain access to the body by way of the intestinal tract. The presentation, although short, is of interest as coming from the pen of one who has devoted many years to a consideration of this subject.

SYNOPSIS OF THE PRACTICE OF PREVENTIVE MEDICINE. By the Faculty of Harvard Medical School. Pp. 186. Cambridge: Harvard University Press, 1929.

The work is precisely what its title and introduction imply. It is an outline, touching a wide variety of topics, planned primarily for teachers of medicine. Emphasis is laid on the fact that preventive medicine is not a separate branch but an important part — often the most important part — of every branch of medical science including the preclinical, such as anatomy, physiology and pharmacology.

The development of the preventive attitude of mind appears to be the object aimed at rather than the presentation of comprehensive data or detailed descriptions of technic. Many new avenues of thought are pointed out, but to pursue them in detail the interested reader must go elsewhere. For this reason the usefulness of the work to the average physician could be greatly increased by more comprehensive references as footnotes.

CORRECTION

In the article by Dr. Lambert Krahulik, "Blood Transfusion in Diseases of Infants and Children," in the January issue of the AMERICAN JOURNAL OF DISEASES OF CHILDREN, pages 42 and 43 were transposed.

Directory of Pediatric Societies

INTERNATIONAL

International Pediatric Congress

Prof. I. Jundell, Artillerigatan 23, Stockholm, Sweden.
Place: Stockholm. Time: Aug. 17-20, 1930.

NATIONAL

American Medical Association, Scientific Assembly, Section on Diseases of Children

Chairman: Dr. William Weston, 1231 Bull. St., Columbia, S. C.
Secretary: Dr. C. A. Aldrich, 545 Lincoln Ave., Winnetka, Ill.
Place: Detroit. Time: June 23-27, 1930.

American Pediatric Society

President: Dr. Joseph Brennemann, 30 N. Michigan Blvd., Chicago.
Secretary-Treasurer: Dr. Howard Childs Carpenter, 1805 Spruce St., Philadelphia.
Place: Windsor Hotel, Montreal. Time: June 17-19, 1930.

Association of American Teachers of the Diseases of Children

President: Dr. Lawrence T. Royster, State Board of Health, University, Va.
Secretary: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.

American Child Health Association

President: Hon. Herbert Hoover, 370 7th Ave., New York.
Secretary: Dr. Philip Van Ingen, 370 7th Ave., New York.
Place: Fort Worth, Texas. Time: October, 1930.

Canadian Society for the Study of Diseases of Children

President: Dr. Thomas Crossan Clark, 51 Herkimer St., Hamilton, Ont.
Secretary-Treasurer: Dr. Frank H. Boone, 164 James St. S., Hamilton, Ont.

SECTIONAL

Central States Pediatric Society

President: Dr. Edward Clay Mitchell, 1073 Madison Ave., Memphis, Tenn.
Secretary: Dr. A. H. Parmelee, 310 S. Michigan Blvd., Chicago.
Place: Memphis, Tenn. Time: Fall, 1930.

Southern Medical Association, Section on Pediatrics

Chairman: Dr. H. Leslie Moore, 1717 Pacific Ave., Dallas, Texas.
Secretary: Dr. Ludo von Meysenbug, 3501 Prytania St., New Orleans, La.
Place: Louisville, Ky.: November, 1930.

STATE

Alabama Pediatric Society

President: Dr. J. MacBell, Mobile.
Secretary-Treasurer: Dr. Hughes Kennedy, Jr., Highland Plaza Apts., Birmingham.

Georgia Pediatric Society

President: Dr. W. N. Adkins, Medical Arts Bldg., Atlanta.
Secretary-Treasurer: Dr. E. N. Gleaton, 212 E. Gaston St., Savannah.

Louisiana State Pediatric Society

President: Dr. J. A. Crawford, Lake Charles.
Secretary-Treasurer: Dr. C. T. Williams, 7401 Burthe St., New Orleans.

Oklahoma State Pediatric Society

President: Dr. William M. Taylor, Osler Bldg., Oklahoma City.
Secretary: Dr. Carol Pounders, 110 W. 10th St., Oklahoma City.
Place: Shawnee. Time: May, 1930.

South Carolina Pediatric Society

President: Dr. M. W. Beach, 126 Meeting St., Charleston.
Secretary-Treasurer: Dr. Julian P. Price, The McLeod Infirmary, Florence.

Texas Pediatric Society

President: Dr. H. P. Ledford, 1310 9th St., Wichita.
Secretary-Treasurer: Dr. John G. Young, 3930 McKinney Ave., Dallas.

Virginia Pediatric Society

President: Dr. Franklin D. Wilson, 136 York St., Norfolk.
Secretary: Dr. J. B. Stone, 2042 Park Ave., Richmond.

LOCAL

Academy of Medicine of Cleveland, Pediatric Section

Chairman: Dr. John Toomey, Cleveland City Hospital, Cleveland.
Secretary: Dr. A. B. Grossman, 7016 Euclid Ave., Cleveland.
Place: 2009 Adelbert Road. Time: Four meetings, from September to May.

Academy of Medicine, Toronto, Section of Pediatrics

President: Dr. G. A. Davis, 12 Belsize Drive, Toronto.
Secretary: Dr. Gladys Boyd, 56 DeLisle St., Toronto.
Time: November 17, December 15, February 16 and March 15.

Bronx Pediatric Society

President: Dr. David I. Frey, 2065 Grand Concourse, New York.
Secretary: Dr. H. M. Eisenoff, 1018 E. 163rd St., New York.
Place: Concourse Plaza, 161st St. and Grand Concourse. Time: Second Wednesday of each month, except June, July, August and September.

Brooklyn Pediatric Society

President: Dr. Joseph F. Paulonis, 1357 Bushwick Ave., Brooklyn.
Secretary: Dr. Irwin Schiff, 658 Eastern Parkway, Brooklyn.
Place: Kings County Medical Society Bldg. Time: Last Wednesday of each month, except June, July and August.

Central New York Pediatric Club

President: Dr. Frank Vander Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Place: Various cities in New York. Time: Fourth Thursday of October, January and April.

Chicago Pediatric Society

President: Dr. Arthur H. Parmelee, 310 S. Michigan Blvd., Chicago.
Secretary: Dr. Bert I. Beverly, 130 S. Oak Park Ave., Oak Park, Ill.
Place: City Club. Time: Third Tuesday of each month.

Detroit Pediatric Society

President: Dr. Wyman C. C. Cole, 2970 W. Grand Blvd., Detroit.
Secretary: Dr. Charles A. Wilson, 71 E. Perry St., Detroit.
Place: Children's Hospital of Michigan. Time: No fixed date; approximately once a month.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Lee Bivings, Exchange Bldg., Atlanta.
Secretary: Dr. William Kiser, Medical Arts Bldg., Atlanta.
Place: Academy of Medicine, 32 Howard St. Time: Second Thursday of each month from October to April, 8 p. m.

Memphis Pediatric Society

President: Dr. G. J. Levy, 899 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. W. R. Graves, 1024 Madison Ave., Memphis, Tenn.
Place: Memphis General Hospital. Time: Second Tuesday of each month.

Milwaukee Pediatric Society

President: Dr. M. G. Peterman, 167 17th St., Milwaukee.
Secretary: Dr. F. R. Janney, 418 E. North Ave., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

Nebraska Pediatric Society

President: Dr. H. B. Hamilton, 434 Aquila Court Bldg., Omaha.
Secretary: Dr. George L. Clark, 1817 Vinton St., Omaha.
Place: As announced by committee. Time: Second Thursday of each month from October to June, inclusive, 6 p. m.

New England Pediatric Society

President: Dr. Grover F. Powers, New Haven, Conn.
Secretary: Dr. Gerald Hoeffel, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: October, January and March.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. F. Elmer Johnson, 300 West End Ave., New York.
Secretary: Dr. Hugh Chaplin, 39 E. 75th St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

North Pacific Pediatric Society

President: Dr. W. F. Patrick, Medical Arts Bldg., Portland, Ore.
Secretary: Dr. L. Howard Smith, Medical Arts Bldg., Portland, Ore.

Northern California Pediatric Society

President: Dr. Edward B. Shaw, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Lloyd Hardgrave, 384 Post St., San Francisco.
Place: Various teaching schools. Time: Monthly.

Northwestern Pediatric Society

President: Dr. C. R. Moriarity, La Salle Bldg., Minneapolis.
Secretary: Dr. E. S. Platou, 730 La Salle Bldg., Minneapolis.
Place: University Campus and Rochester, Minn. Time: Winter, Spring, Summer, Fall.

Philadelphia Pediatric Society

President: Dr. Ralph M. Tyson, 334 S. 21st St., Philadelphia.
Secretary: Dr. John D. Donnelly, 115 Bryn Mawr Ave., Bala-Cynwyd, Pa.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to June, inclusive.

Pittsburgh Pediatric Society

President: Dr. David H. Boyd, 200, 9th St., Pittsburgh.
Secretary: Dr. Theodore C. Elterich, Highland Bldg., Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate months.

Richmond Pediatric Society

President: Dr. J. B. Stone, 2042 Park Ave., Medical Arts Bldg., Richmond, Va.
Secretary-Treasurer: Dr. Samuel A. Anderson, Jr., 2326 W. Grace St., Richmond, Va.
Place: Westmoreland Club, 601 E. Grace St. Time: First Thursday of each month (other than during the summer).

Rochester Pediatric Society

President: Dr. John Aikman, 184 Alexander St., Rochester, N. Y.
Secretary: Dr. Howard F. Rowley, 278 Alexander St., Rochester, N. Y.
Place: Arranged by program committee. Time: First Friday of each month from October to May.

Rocky Mountain Pediatric Society

President: Dr. Elsie Seelye Pratt, Republic Bldg., Denver.
Secretary-Treasurer: Dr. Wilford W. Barber, Metropolitan Bldg., Denver.
Place: Children's Hospital, Denver. Time: Third Saturday of each month from September to May, inclusive, 2:30 p. m.

St. Louis Pediatric Society

President: Dr. Park J. White, Beaumont Bldg., St. Louis.
Secretary-Treasurer: Dr. Ralph L. Cook, 508 N. Grand Blvd., St. Louis.
Place: St. Louis Children's Hospital. Time: At least once a year and contingent thereafter on the arrangement of a suitable program.

Seattle Pediatric Society

President: Dr. Vernon W. Spickard, Cobb Bldg., Seattle.
Secretary: Dr. Raymond H. Somers, Cobb Bldg., Seattle.
Place: College Club. Time: Third Friday of each month, 7 p. m.

Southwestern Pediatric Society

President: Dr. Ezra S. Fish, Pacific Mutual Bldg., Los Angeles.
Secretary: Dr. Fred L. Glascock, 1136 W. 6th St., Los Angeles.
Place: University Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. W. D. Lyon, 101 S. Balch St., Akron, Ohio.
Secretary: Dr. John P. Parsons, 320 S. Division St., Ann Arbor, Mich.
Place: Ann Arbor, Mich. Time: About July 15, 1930.

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